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# USSR Report

CHEMISTRY

No. 90

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27 August 1982

## USSR REPORT

## CHEMISTRY

No. 90

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## AEROSOLS

### NEW AEROSOL PEST CONTROL METHOD DEVELOPED

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 16 Jun 82 p 2

[Article: "Help From an Aerosol"]

[Text] A scientific-production detachment of aerosol plant protection workers has been sent from Novosibirsk to Kazakhstan. Using a new method developed by the Institute of Chemical Kinetics and Combustion, Siberian Department, USSR Academy of Sciences, the specialists will begin a fight against farm pests over large areas of virgin land.

"The principle behind our procedure is something we have all come across in our daily lives many times," explained the group leader, V. Sakharov. "It has been noted, for example, that when it is foggy, a person's hair quickly gets wet. This property particles have for selectively 'sticking' to objects of different dimensions and shapes was utilized in our design of an air flow generator used to spray chemical preparations. We experimentally selected the dimensions of particles capable of settling on some species of flying and crawling insects. Agricultural crop pests perish quickly in such a cloud. Moreover environmental contamination is much lower than with treatment of fields by aircraft spraying of toxic chemicals."

Novosibirsk scientists will carry this new procedure to different agricultural zones of the country in the present five-year plan. Forestry specialists are interested in it as well. The first aerosol protection detachment of their sector has been created in the Bashkir ASSR.

11004  
CSO: 1841/261

UDC 541.18.2/3

DIFFUSION PRECIPITATION OF AEROSOLS IN MODEL FILTER AT LOW PECLET NUMBERS

Moscow ZHURNAL FIZICHESKOY KHMII in Russian Vol 56, No 5, May 82  
(manuscript received 11 Jun 81) pp 1304-1305

CHECHUYEV, P. V. and KIRSH, A. A., Scientific Research Physico-Chemical Institute imeni L. Ya. Karpov, Moscow

[Abstract] The title precipitation is of interest in studying gas and vapor adsorption by fibers and trapping products of the disintegration of radioactive inert gases, as well as in studies of gas filtration by fiber filters of less than  $10^{-5}$  cm diameter fibers. The authors measured the trapping coefficient in parallel cylinders at low Peclet numbers as it approaches its extreme limit. Parallel 8.9 mcm fibers spaced at 66.8 mcm formed a filter  $0.485 \text{ cm}^2$ . Sodium chloride particles with average  $15-100 \text{ \AA}$  diameter were transmitted as the aerosol through a measuring channel containing several fibers and through a control channel or equalizer with a single screen for speed control. Experimental results coincided with theoretical projections for Peclet numbers to 0.5, and are described as  $b = 2.9 k^{-1/3} Pe^{-2/3}$ .

Figure 1; references 3 (Russian).

[249-12131]

ANALYTICAL CHEMISTRY

UDC 543.544.2 : 543.38

IDENTIFYING ISOMERIZING ORGANIC COMPOUNDS IN INDUSTRIAL SEWAGE

Kiev KHIMIYA I TEKHOLOGIYA VODY in Russian Vol 4, No 2, Mar-Apr 82  
(manuscript received 8 Oct 81) pp 151-153

KERZHNER, B. K., VRUBEL', T. L. and KOFANOV, V. I., Institute of Colloid and Water Chemistry imeni A. V. Dumanskiy, UkrSSR Academy of Sciences, Kiev

[Abstract] Widely used chromatographic methods for analyzing organic wastes in sewage require various independent spectral methods and mass spectrometry due to the lack of standards. The authors propose a new approach based on the phenomenon of photoisomerization and two-dimensional chromatography. Since activation energy of cis-trans-isomerization is generally higher than in tautomeric conversions, the mixtures of cis-trans-isomers separate and show up on the chromatograms. The hypothesis was tested on dibutyl ester of ethylene carbonic acid, trans-stilbene, trans-azobenzene and trans-azoxybenzene, with corresponding cis-isomers obtained by irradiating the solutions with ultraviolet light. The method was successful in identifying photoisomerization of the compounds listed when they were adsorbed on silica gel. Figure 1; references 4: 1 Russian, 3 Western.  
[223-12131]

UDC 628.312 : 542.87

APPLYING REDOX-METRY TO EVALUATING POLLUTION OF CITY SEWAGE

Kiev KHIMIYA I TEKHOLOGIYA VODY in Russian Vol 4, No 2, Mar-Apr 82  
(manuscript received 25 Sep 81) pp 153-156

KOLBASOV, G. I., KRUNCHAK, V. G., NIKOLAYEV, A. N. and NAUMOV, A. V., All-Union Scientific Research Technological Institute of Antibiotics and Enzymes for Medicinal Use, Leningrad

[Abstract] Chemical and biological consumption of oxygen are basic parameters for measuring the quality of city sewage water. The authors studied the possibility of using the redox-metry method to determine water purification capacity needs for the Leningrad water supply. The oxidation and

reduction system used was potassium ferri-ferrocyanide-  $K_3Fe(CN)_6 + K_4Fe(CN)_6$ . The authors measured pH and concentrations of oxidised and reduced forms. Despite the wide variations in sewage water conditions, the authors identified a parameter for purification,  $E_t$ , which correlated well with chemical oxygen consumption data determined by the bichromatic method and could also be used to evaluate biological oxygen consumption. The method is simple and requires no elaborate equipment. Figures 3; references 7 (Russian).  
[223-12131]

UDC 621.355.1

#### ANALYSIS OF BARODYNAMIC CURVES IN CHARGING NICKEL-HYDROGEN BATTERIES

Moscow ELEKTROKHIMIYA in Russian Vol 18, No 5, May 82 (manuscript received 19 Mar 79) pp 643-644

MOLOCHNIK, T. A. and TSEENTER, B. I., All-Union Scientific Research Institute for Batteries, Leningrad

[Abstract] Data indicate that at initial stages of charging nickel-hydrogen batteries hydrogen is produced on the hydrogen electrode; as the capacity of the nickel oxide electrode is exhausted oxygen is generated, which then ionizes on the hydrogen electrode. At one extreme, where oxygen ionization is equal to the charge current, a stationary state is achieved where pressure does not change. At the other extreme, oxygen is generated without ionization. Internal pressure above the stoichiometric level is compensated by a reduced pressure within the system related to the oxygen ionization. The linear pressure-capacity curve must be accompanied by a lack of battery heating during charging to determine the absence of gaseous oxygen.

Figure 1; references 3: 2 Russian, 1 English.

[242-12131]

UDC 542.61 : 543.70

#### EXTRACTION-PHOTOMETRIC DETERMINATION OF URANIUM(VI) BY 8-HYDROXYQUINOLINE AND BUTYLRHODAMINE

Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian Vol 37, No 5, May 82 (manuscript received 11 May 81) pp 855-861

ALIMARIN, I. P., GOLOVINA, A. P. and RUNOV, V. K., Moscow State University imeni M. V. Lomonosov

[Abstract] Uranium(VI) content has long been determined by toluene or benzene extraction of ion associates that contain anion chelates and basic dyes, using relatively selective but insensitive methods. The authors

studied the possibility of combining previously concentrated U<sup>VI</sup> by 8-hydroxy-quinoline extraction with determination of the element in the organic phase in the ion-associate form using butylrhodamine. The Box-Wilson mathematical planning method was used to determine optimal conditions of extraction photometry in pure U<sup>VI</sup> salts, in monazite sand and sea water. In the latter two locations, the uranium was first concentrated in the presence of EDTA with 0.5 solution of 8-hydroxyquinoline, then determined as an ion associate with ButRh. Since early variants of the test had poor replication, adjustments were made that provided improvement by a factor of 7. The method also permitted determination of pH, 8-hydroxyquinoline concentration, butylrhodamine content and their effects when reacting. In the presence of EDTA, uranium(VI) determination was not hampered by 5000 times its quantity of Ni, Mn<sup>II</sup> or copper, or 1000 times its quantity of lanthanoids, Th or Fe<sup>III</sup>. The assay was equal to previous methods at the lowest level of detection and better than them in selectivity. Figures 3; references 11 (Russian).  
[250-12131]

UDC 543.544 : 546.131 : 543.847

#### SELECTIVITY OF THERMOIONIC DETECTOR

Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian Vol 37, No 5, May 82  
(manuscript received 20 Apr 81) pp 887-889

DEVYATYKH, G. G., KRYLOV, V. A., MAKAROV, V. Ye. and VTOROV, B. G., Institute of Chemistry, USSR Academy of Sciences, Gor'kiy

[Abstract] Thanks to its use of small samples and high accuracy, gas chromatography has wide application, but high sensitivity to compounds containing chlorine, phosphorus, silicon, germanium and arsenic interfere with identifying small concentrations. The authors tested the selectivity of a method for analyzing inorganic chlorides using a thermoionic detector based on a chromatographic device equipped for analyzing substances that readily hydrolyze and are aggressive. Necessary equipment adaptations and chemical procedures are presented in the experimental section. The device covered more than 3 orders in its range, and had high sensitivity to inorganic substances containing phosphorus, which surpassed its sensitivity to chlorides of other elements by a factor of 2-4. The detector was more stable in operation and could detect phosphorus trichloride and oxychlorides to a lower limit of 3·10<sup>-6</sup>%. Figures 3; references 5 (Russian).  
[250-12131]

BIOCHEMISTRY

ALGAE USED AS ANIMAL FEED ADDITIVE

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 20 Jun 82 p 2

[Article by V. Proskura: "Experience Finds Successors"]

[Text] The Baltic's first agroindustrial operation producing *Chlorella* suspension has been created near Riga. It is being supplied to the neighboring "Kekava" Experimental-Demonstration Poultry Factory.

Unicellular algae called *Chlorella* cover local water basins in summer. Experiments by Latvian scientists confirmed that the biological activity of these algae has no competitors within the plant world of the region. When added to the feed ration, these specially processed microscopic plants produce substantial weight gains in animals and birds, and especially in broilers.

The experience of "Kekava" is now being disseminated successfully among other agroindustrial complexes in the republic, where concentrated feed additive shops are also being created.

11004  
CSO: 1841/261

UDC 615.276 : 547.564.4

AMINO ACIDS AS AMINE COMPONENTS IN MANNICH REACTIONS

Moscow USPEKHI KHMII in Russian Vol 51, No 4, Apr 82 pp 678-695

AGABABYAN, A. G., GEVORGIAN, G. A., and MNDZHOYAN, O. L., Institute of Fine Organic Chemistry imeni A. L. Mndzhyan, ArSSR Academy of Sciences, Yerevan

[Abstract] Aminomethylation by the Mannich method involves substrata condensation with at least one active hydrogen atom and formaldehyde, and primary or secondary amines or ammonia. A wide selection of reagents and the mild conditions make the Mannich reaction very important, but aminomethylation by amino acids has received little attention. The authors review compounds produced by such reactions as used in medicine for antiphlogistic, fever reducing, spasmolytic, adrenolytic, H-cholinolytic and analgesic properties. Aminomethylation of CH-acidic components, e.g., phenols, produced both usual derivatives and polymers with benzene nuclei bound by methylene groups. With NH-acidic components, such combinations as amine-formaldehydeamide and amine-formaldehyde-guanidine reacting in neutral and acid media are discussed. For example, tetracycline aminomethylation with glycine, alpha-alanine, phenylalanine, ornithine and arginine produces monoaminomethyltetracyclines. With PH-acidic components, the Mannich reaction may produce N-phosphonomethylglycines. The biological properties of alpha-amino acid derivatives of Mannich reactions have high bactericidal activity, and can be used against Gram-positive and Gram-negative microorganisms in the textile and paper industries. The hydrochloride of the ethyl ester of N-[beta-isobutoxybenzoyl] glycine was an effective antiphlogistic and fever-reducing agent without great toxicity. Three compounds of N-[beta-(alkoxybenzoyl)ethyl]glycines showed some promise in treating Ehrlich's adenocarcinoma. N-phosphonomethylglycines have been shown to be highly effective pesticides and plant growth regulators.

References 132: 20 Russian, 112 Western.

[226-12131]

REACTIONS OF METALS AND PROTEINS

Moscow USPEKHI KHMII in Russian Vol 51, No 4, Apr 82 pp 696-711

BEZRUKOV, M. G., BELOUSOVA, A. M. and SERGEYEV, V. A., Institute of Elemental Heteroorganic Compounds imeni A. N. Nesmeyanov, USSR Academy of Sciences, Moscow

[Abstract] The authors review the literature on various types of metal-protein reactions and evaluate the role of metals at different levels of protein organization. Biological functions and types of reactions in metal-protein systems include the presence of Mn(II) ions in arginase and of Zn(II) ions in carbonhydrase, redox proteins involved in nitrogen fixing, mitochondria breathing, etc., and carrier proteins such as transferrin, hemoglobin and others. Intermediary, hydrophobic and ligand reactions, heavy metal combination with protein molecules, and supramolecular compounds forming reserve proteins such as ferritine, produce several types of metal-protein biological compounds. Bonding of metals by functional protein groups differs sharply from the bonding of the same metals in peptides and amino acids, where there is a cooperative nature to the reaction. Consideration of hard and soft acids and bases makes it possible to predict the relative durability of metal-protein coordination bonds. Useful results in this area have been achieved by study of copper and ribonuclease, which has determined the coordination of Cu(II) with functional groups of amino acids of ribonuclease residue. Studies of the effects of metals on various levels of protein organization, such as for collagen, have shown that the dependence of enzyme catalytic activities on metal cations is a sensitive indicator of tertiary changes in protein structure. Zinc reacts with insulin to form hexamer aggregations and slows the latter's absorption. Practical applications of metal-protein compounds include use to precipitate protein from solutions, use in electron microscopes, food preservation and medicine. Figures 5; references 132: 13 Russian, 119 Western.

[226-12131]

PHYSIOLOGICALLY ACTIVE POLYMERS AND MACROMOLECULAR THERAPEUTIC SYSTEMS

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 24, No 4, Apr 82 (manuscript received 6 Aug 80) pp 675-695

PLATE, N. A. and VASIL'YEV, A. Ye., Moscow State University imeni M. V. Lomonosov; Branch for Preparation of Finished Pharmaceuticals, Scientific Research Institute for Biological Testing of Chemical Compounds

[Abstract] The authors review biomedical uses of polymers, beginning with biologically-tolerated endoprostheses and ancient herbal medications and

continuing with, and concentrating on, modern uses both as direct synthetic medications and as time-release substances for regulating the effects of other medications. Unique medical preparation include antisilicotic and antiheparin medications in the four groups of neutral polymers, polycations, polyanions and others. Polymers with bound iodine have high bactericidal action with low toxicity. Water-soluble grafted polymers determine physico-chemical properties of certain medications consisting of enzymes or other proteins, and reduce the latters' antigen action. These polymers can also alter membrane-penetration features, thus controlling the rate of medication delivery. Most medicinal polymers synthesized to date have intracellular action. The chief problem in targeting medicinal polymers is the creation of in vivo conditions for affine chromatography: another difficulty lies in assuring penetration of cell walls, and in this characteristic medicinal polymers are far superior to previously used low-molecular medications. Various biopolymers and derivatives, complex-chain and carbon-chain polymers are discussed. Corpuscular microparticles and microspheres, macromolecular therapeutic systems placed within the body and ones unconsciously distributed, diffusion by concentration variation, and osmotic pressure diffusion are also discussed. Figures 8; references 133: 46 Russian, 87 Western.

[228-12131]

## CATALYSIS

UDC [546.814 + 546.865] - 31 : 66.094.37 : 573.31

### ELECTRICAL PROPERTIES OF LEAD-ANTIMONY OXIDE CATALYSTS

Moscow ZHURNAL FIZICHESKOY KHIMII in Russian Vol 56, No 5, May 82  
(manuscript received 21 Apr 80) pp 1133-1135

LEMBERANSKIY, R. A., ANNENKOVA, I. B. and LIBERMAN, Ye. S., Azerbaijan  
Institute of Petroleum and Chemistry imeni M. Azizbekov, Baku

[Abstract] Previously the authors studied the phase composition and catalytic properties of lead-antimony oxide contacts and attempted to explain their activity in partial olefin oxidation by the formation of solid solutions in the lead-antimony oxide system. In the present study, they treat electrical properties of those oxides seeking correlations with other physicochemical properties. After synthesizing samples, the authors measured electrical conductivity in a constant current by a sounding method, with thermo-electromotive force and the direction of electrical conductivity changes in the oxidizing and reducing media determining the type of conductivity. At room temperature, lead dioxide and lead-antimony catalysts were judged to be n-semiconductors. The type of conductivity of  $\text{SnO}_2$  did not change under catalyzing conditions. At high temperatures the tested binary catalysts behaved like p-semiconductors: in an oxidizing atmosphere their conductivity grew, but in the presence of gaseous isobutylene it decreased. This was apparently caused by the presence of  $\text{Sb}_2\text{O}_4$ . Up to 10% by atmosphere, introducing antimony into  $\text{SnO}_2$  rapidly increased its electrical conductivity, while higher amounts decreased it. The experiments showed that the electrical conductivity of binary catalysts is characterized by a low temperature coefficient and relatively little dependence on the nature of the reactive medium. Figures 2; references 7: 5 Russian, 2 English.  
[249-12131]

## CHEMICAL INDUSTRY

### SOCIALIST COMPETITION TERMS CALLED UNFAIR

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 15 Jun 82 p 2

[Article by V. Tarkhov, director, Synthetic Alcohol Plant, V. Gelis, chairman, trade union committee, and A. Sorokin, chief, division of economic planning: "No Matter How Hard you Try..."]

[Text] Once five enterprises of the USSR Ministry of Petroleum Refining and Petrochemical Industry in Kuybyshevskaya Oblast were grouped together into the "Kuybyshevnefteorgsintez" Production Association. Two of them--the Syzran' and Kuybyshev petroleum refineries--retained their legal independence, while three--the Novokuybyshevsk Petroleum Refinery, our synthetic alcohol plant and a machinery and repair plant--were given the status of production units.

Concentration of production and improvement of the management structure were the will of the times. But the practical work of the production collectives within the association revealed one serious shortcoming.

Socialist competition is known to play a role in raising labor productivity, improving production and increasing its effectiveness. Now everyone understands the influence of moral and material stimuli upon development of labor rivalry. A valid assessment of the results of the activities of a single person and the whole collective is the best stimulus of enthusiasm in work. But it is precisely here that the collectives of the "production units" found themselves in a strange situation. The problem is that since 1976 they have been deprived of the right to participate on their own in the all-union socialist competition by a decision of the Central Committee of the Trade Union of Workers of Chemical and Petrochemical Industry and the Ministry of Petroleum Refining and Petrochemical Industry. Our successes can be rewarded only if the production association as a whole is awarded a winning place.

So what happens? While in the 21 quarters for which the association has existed the independent enterprises--the Syzran' and Kuybyshev oil refineries--have earned prizewinning places in the all-union socialist competition many times among the sector's enterprises, and they have won Red Banners and prizes, the association as a whole has only managed to do so three times. Consequently we, the workers of the "production units," could be rewarded for good work that many times as well.

Moreover when our collectives do receive prizes, their dimensions (calculated per worker) are significantly lower. Last time, the association allocated us a bonus totaling 15,490 rubles, while were the plant an independent unit, it would have qualified for almost 30,000 rubles. The discrepancy is a little too great.

The association's executives are not to blame for this. There is a statute according to which the dimensions of prizes paid to winners of a competition, calculated on a per-worker basis, are decreased as the number of winning collectives increases (the upper limit is 10 rubles, and the lower limit is 2 rubles 50 kopecks). But in this case the collectives of legally independent enterprises are in more advantageous conditions than we. After all, our prize is only part of the reward given to the large association.

There is no way all of this can be explained to laborers who are working in the former conditions but are now being rewarded worse. Thus we find that no matter how hard we try, we do not get recognition if our other partners in the association let us down.

Recently we were visited by colleagues from the Chemical Plant imeni 50-Letiye SSSR in Groznyy. This enterprise, which had once been independent, was also reorganized into a "production unit." Before, this collective was famous throughout the country: It won prizewinning places in the all-union socialist competition 52 times. But now it also has been "excommunicated" from the competition.

The executives of the association and of the "production units" wrote the central committee of the sector's trade union and the ministry about all of this many times with the hope of making some changes in the terms of the competition. All the more so because the decree "On the All-Union Socialist Competition for Successful Fulfillment and Overfulfillment of the Quotas of the 11th Five-Year Plan," adopted by the CPSU Central Committee, the USSR Council of Ministers, the AUCCTU and the Komsomol Central Committee, states directly: As with all other enterprises, an association's "production units" can be awarded perpetual Red Banners--that is, they may be direct participants of the all-union competition. But the changes never followed. Then V. Semenov, a machine operator of the Novokuybyshevsk Petroleum Refinery, brought this problem up for discussion by participants of a congress of the sector's trade union.

It was with a sense of bewilderment that we read the reply to Semenov's statement, given by the chairman of the central committee of the sector's trade union, G. Sukhoruchenkov. It states that according to the terms of the all-union socialist competition among collectives of the production associations, enterprises and organizations of the Ministry of Petroleum Refining and Petrochemical Industry, "production units" and independent enterprises contained within an association compete within the framework of the association on the basis of its conditions, and that they do not compete independently in a sector competition.

This reply was signed 25 January 1982. But the competition terms it refers to were repealed on 25 August 1981 by a joint decision of the USSR Ministry of Petroleum Refining and Petrochemical Industry and that same trade union central committee. Nor is there any truth in the assertion that independent enterprises do not participate in sector competitions.

We would like to recall the contents of a directive letter from the USSR Ministry of Petroleum Refining and Petrochemical Industry and the central committee of the sector's trade union dated 6 May 1978, "On Establishing the Dimensions of Money Prizes Paid as Rewards to Collectives Winning the All-Union Socialist Competition," which has never been repealed by anyone and which was published on the basis of a corresponding decree of the USSR State Committee for Labor and Social Problems and the Presidium of the AUCCTU. According to this document, we are equal participants in the sector competition. However, we are no longer even being told of the terms of the competition of the sector's enterprises.

We believe this to be an abnormal situation. Any reorganization of production management should not suffocate but develop the labor rivalry of production collectives, no matter what name is given to them.

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CSO: 1841/261.

BRIEFS

ETHYLENE STORAGE--Plastics production will be started at one of East Siberia's largest chemical plants presently under construction near the city of Zima. It is now producing chlorine from out of a highly rich deposit of rock salt lying in the earth as seams up to 80 meters thick. But the plant will also need ethylene to obtain its principal product. It will be supplied to the plant by the "Angarsknefteorgsintez" Production Association. A 217-kilometer gas main has already been laid from Angarsk to Zima. Construction of a unique ethylene storage facility has now begun at the end of this route. [By Yu. Levitskiy, Irkutskaya Oblast] [Text] [Moscow SOVETSKAYA ROSSIYA in Russian 23 May 82 p 1] 11004

DIETHYLBENZENE PRODUCTION--A new product, high quality diethylbenzene, has been obtained at the Cherepovets Nitrogen Fertilizer Plant. It has no equals in the country in terms of its technical characteristics. Diethylbenzene has broad application today--from metallurgy to medicine. With its help, useful substances can be extracted from sea water, and medical industry will have the capability for creating an artificial kidney. [By V. Minin, Cherepovets] [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 20 Jun 82 p 2] 11004

CSO: 1841/261

ACADEMY'S SIBERIAN DEPARTMENT DESCRIBES RESEARCH PROGRAM

Moscow ZNANIYE-SILA in Russian No 5, May 82 pp 1-3, 29

[Interview with Academician V. A. Koptyug by correspondents M. Kuryachey and M. Adzhiyev: "Siberian Acceleration: Science and Practice"]

[Excerpts] Twenty-five years ago a new scientific center was created not far from Novosibirsk--the Siberian Department of the USSR Academy of Sciences. During this time the department has successfully handled continually growing national economic tasks, and the center's scientists have made a substantial contribution to developing fundamental scientific problems. An interview conducted by our correspondents M. Kuryachey and M. Adzhiyev with the chairman of the Presidium of the Siberian Department of the USSR Academy of Sciences, Academician V. A. Koptyug, was devoted to the grandiose transformations of Siberia and to the role the department is playing in the enormous amount of work going on now and still to do.

[Answer] Siberia is a gigantic territory occupying tens of millions of square kilometers. Almost 40 percent of the area of the entire Soviet Union! And in the 20 years of its existence the Siberian Department has been methodically developing these enormous regions, creating its own institutes, divisions and laboratories in Novosibirsk, Irkutsk, Yakutsk, Ulan-Ude, Tomsk and Krasnoyarsk.

Twelve years ago the Far Eastern Scientific Center of the USSR Academy of Sciences budded off from us, and "remote" divisions and laboratories have been created in Barnaul, Kemerovo, Kyzyl, Omsk and Tyumen'.

We should also note the following. The Siberian Department was created with the purpose of ensuring, through the development of fundamental research, solution of applied problems fundamentally important to Siberia's national economy.

Here is a concrete example: Expansion of the scale of industrial development of new Siberian territories made it extremely important to study the behavior of materials at low temperatures. This fundamental problem is of interest to many areas of science. But it is vitally important to northern Siberia: In

severe cold, metal becomes brittle, breakdowns and mishaps arise, and as a result machinery stops. This is why solving the problems associated with the behavior of matter and materials at low temperatures was one of the main directions of the work of the Institute of Physical Technical Problems of the North in Yakutsk.

Or take another topic which would seem to be of purely theoretical research interest--studying the flow of particles from outer space and their interaction with the earth's magnetic field and with the upper layers of the atmosphere. Why is this phenomenon being studied in Yakutsk? Because many physical processes associated with outer space proceed more clearly at higher latitudes, and because they have an especially great influence on the stability of radio communication in northern regions.

There are many such examples.

[Question] But is there not a danger in focusing the work of the institutes and their research on local problems? Might Siberian scientists striving to satisfy regional interests miss some of the phenomena that are important to world science?

[Answer] Unfortunately, even a brief description of the achievements of Siberian scientists in this area would take too much time. Therefore I will limit myself to simply listing them: development of the theory of volume determination formulas in mathematics; development of new numerical methods of solving the problems of mathematical physics and mechanics; validation of the grounds for the principles of building linear accelerators containing facing electron-positron beams; simulation (numerical and experimental in the laboratory) of complex phenomena such as hurricanes, cyclones and tornadoes; revelation of the features of the energy spectrum of cosmic rays by noncolliding shock waves; development of models of the earth's magnetosphere and ionosphere; development of the theory of catalytic reactions; discovery of the influence of the magnetic field on some types of chemical reactions and development of the theory of this phenomenon; synthesis of the gene for a human hormone, angiotensin, participating in regulation of blood pressure, and so on.

Each of these areas of research and many others doubtlessly deserve separate discussion in view of their importance.

[Question] Valentin Afanas'yevich, this is a very impressive list, and it says a great deal, even to the layman. But could you discuss in greater detail at least one project which you feel is especially important?

[Answer] In my opinion discussion of just one project would provide too narrow an impression of the fundamental research being conducted by scientists of our department. But if I must, let me touch upon a very important problem--the influence of such research on the effectiveness of social production. After all, the party's concern for preferential development of fundamental research is no accident. The results of fundamental research as a rule make revolutionary changes in practice.

Let me limit myself to just two examples: exploration for and extraction of minerals and the food program. The achievements of Siberian scientists are especially evident in these areas.

The 26th CPSU Congress turned special attention to developing progressive methods of geophysical and geochemical research. This is understandable: These methods are effective specific tools permitting us to "peek" into the depths of the earth.

A significant proportion of the assets invested into prospecting for minerals are now being spent on prospecting for oil and gas. Oil prospectors advancing into new regions are having to deal with increasingly more complex geological conditions and with the unique nature of the deposits. And what about permafrost? What about the rock concealing the resources? This rock covers enormous territories of eastern and northern Siberia, and it makes exploration very difficult.

To surmount these difficulties our department is developing vibroseismic prospecting methods. They are especially effective in investigation of large areas of significant depth. By combining them with electronic prospecting methods we open up the possibilities for direct detection of oil deposits. This means that the volume of exploratory drilling would decrease significantly. Thus the efforts of Siberian scientists will make it possible, in the final analysis, to noticeably reduce outlays on searching for the deposits.

Or here is another project. Studying the dispersal of various chemicals in loose deposits and then computer-processing the results, we can quickly and reliably evaluate the metal content of large territories. What does this mean? Once again the outlays would be decreased: Unpromising territories are immediately excluded from the zone of exploration. Thus by using the method proposed by Siberian geochemists we can reduce outlays on searching for deposits of optical calcite by a factor of four. And research on gold geochemistry has created conditions for enlarging extraction of this noble metal in the economically developed regions of Siberia.

Scientists of the Institute of Geology and Geophysics have managed to decode the highly interesting information "recorded" in pyropes--minerals usually found in association with diamonds. Serious research revealed that the chemical composition of pyropes depends on the conditions in which a kimberlite funnel forms. Knowledge of such conditions is very important, since it would permit us to reach conclusions as to whether or not diamonds are present. Consequently it does make sense to keep the project going.

All of these examples show how science is helping us to accelerate or cheapen exploratory and evaluational studies. But there are more things I would like to say about the extraction of natural resources.

Today the mining sectors of industry are "eating up" the lion's share of capital investments into Siberia's economy. To satisfy the country's demand for raw materials we are forced to advance into sparsely inhabited regions of northern and eastern Siberia and penetrate deeper and deeper into the earth--that is, the outlays are constantly growing. How could we reduce them?

One of the ways is to reduce the laboriousness of production, or in other words, to raise automation and mechanization. We know that the most labor-intensive processes in mineral extraction are well drilling, breakdown of rock, and the loading and transport of rock. Utilizing the results of theoretical research, scientists of the Mining Institute have developed new mechanisms such as, for example, pneumatic percussion reamers and vibrating loading-unloading units.

These examples show that the department enjoys good possibilities for intensifying mining industry. And in the conditions offered by Siberia, with its limited labor resources, achievement of these possibilities is especially important.

[Question] You promised to say more about the food program, to which special attention was devoted at the 26th CPSU Congress and at the November (1981) Plenum of the CPSU Central Committee. Our journal has already carried articles on some achievements of Siberian scientists in increasing agricultural production. What are the latest results of work in this area?

[Answer] It was no accident that I brought up the food program. It provides excellent confirmation for the thesis that fundamental research is important to practice.

Here is what might seem to be a totally irrelevant example. Geologists of the Siberian Department did some work on a purely theoretical problem--evolution of salt-bearing formations. This research opened up a new way for predicting the locations of mineral deposits. The Nepskiy potassium basin of East Siberia, in all probability the largest not only in the country but also in all the world, was discovered on the basis of a forecast made by Academician A. L. Yanshin.

What relationship could this have to the food program? The most direct: The yields of cereal and other agricultural crops could be raised dramatically in such areas by introducing mineral fertilizers, potassium fertilizers in particular, in the fields.

Siberia needs mineral fertilizer industry, which means it also needs potassium and phosphate raw materials. Discovery of the Nepskiy potassium basin will doubtlessly create the raw material base needed for production of potassium fertilizers.

[Question] But what about phosphates?

[Answer] There are some phosphorite deposits of unappreciable size in Siberia. It would naturally be unfeasible to create large chemical combines near them. The scientific grounds for a new method, so-called mechanochemical activation of phosphorus ore, have now been created. In contrast to traditional methods, this one does without sulfuric acid. But most importantly it opens up a new, more advantageous and convenient form of production organization--that is, it permits the use of mobile machine units in place of large combines, and thus it makes development of small phosphorite deposits, formerly viewed as unprofitable, effective.

Thus the raw material base for producing mineral fertilizers has now been prepared in Siberia. Now it is up to industry.

[Question] Would I be correct in saying that work on isolation and study of plant growth hormones can be included in the group of studies important to the food program?

[Answer] We have developed experimental processes and we now have a plant which is prepared to produce such preparations. We are now waiting on the results of extensive state tests.

I would also like to discuss another interesting project completed by Novosibirsk chemists jointly with specialists in aerodynamics. The insect pests of agriculture and forestry are basically controlled today by toxic chemicals. It is no secret that this does serious harm to the surrounding environment. Our specialists studied how aerosol particles behave themselves as they flow around different obstacles, for example plant leaves with caterpillars sitting on them. As a result they proposed a ground spraying procedure in which most of the particles of a toxic chemical would settle selectively on insects, and only a small proportion would land on plants and dirt. This would reduce the outlays, dramatically increase labor productivity and, what is most important, severely reduce toxic chemical residues in soil.

[Question] Valentin Afanas'yevich, creation of new highly productive varieties of agricultural plants and animal breeds is still believed to be the key problem of the food program. We know that Siberian scientists have made a substantial contribution to solving this problem. We have already heard about new varieties of wheat, rye, corn, soy and sugar beets developed in Siberia. Interesting experiments have been conducted by the Institute of Cytology and Genetics. What can we expect from these projects?

[Answer] The new varieties you have mentioned were basically developed by the method of chemical and radioactive mutagenesis--that is, by influence upon the hereditary traits of plants. These plants are distinguished by higher yields and resistance. Novosibirskaya 67, a variety of wheat created by radioactive mutagenesis in collaboration with scientists of the Siberian Department of the All-Union Academy of Agricultural Sciences imeni V. I. Lenin, is successfully adapting itself to Siberian fields.

Efforts to breed new varieties are continuing. Productive varieties of winter wheat and winter rye created by Siberian scientists are undergoing state testing. A hybrid sugar beet providing a 10-15 percent greater yield of sugar has been obtained.

Many interesting things can also be said about efforts to create new breeds of animals. The Institute of Psychology and Genetics noted above was the first to obtain viable and fertile hybrids of the domestic pig and the wild boar. What is important is that they have been adapted to maintenance in industrial complexes. These are only the first steps in utilizing the rich genetic fund of primitive breeds and wild animals. We plan to continue our work in this direction in Altay: A genetic center is now being created there.

[Question] The food program also foresees measures to ensure preservation of agricultural products. What is being done by the Siberian Department of the USSR Academy of Sciences in this connection?

[Answer] My answer may perhaps seem unexpected, but of all things, the achievements of high energy physics may play a large role here. Yes, I mean what I say: Scientists of our department's Institute of Nuclear Physics have developed a number of industrial accelerators and organized production of small series of such accelerators. Radiation technology is already being used in grain treatment: Accelerators are being used to destroy insects that spoil grain during storage.

[Question] But is this not dangerous? It is radiation, after all....

[Answer] Our specialists conducted some experiments with elevators in Novosibirsk and Odessa. The new technology is absolutely safe, and it is very effective. And radiation treatment of potato tubers not only prevents germination and rotting of the tubers but also raises their yield when planted.

I started and finished my story about efforts in the food program with examples of outwardly unexpected applications of fundamental research to practice. I did this on purpose in order to once again emphasize that as a rule, the major results of such research can be applied to many sectors of the national economy.

[Question] To be sure, there are concrete examples of this as well?

[Answer] Yes, there are many. But I will return to the radiation technology that we have already discussed. The accelerators of the Institute of Nuclear Physics I mentioned earlier are being used successfully to raise the stability of plastic used in cable articles, to produce heat-resistant polyethylene tubing (we know that 1 ton of such tubing saves 5 tons of metal) and to sterilize medical instruments. And imagine what sort of possibilities are opened up for creating new production processes! Cement production, treatment of synthetic leather, paints and varnishes, waste water treatment and so on.

Here is where, in my opinion, fundamental research is especially effective from the standpoint of practice: The need for finding a unique particular solution for each case is eliminated.

[Question] Valentin Afanas'yevich, it is no secret that introducing scientific achievements into practice is another problem. It is no accident that L. I. Brezhnev noted at the 26th CPSU Congress that introduction of scientific discoveries and inventions is now the decisive and most critical area. We can see from your story that the Siberian Department has a powerful potential for developing innovations important to the national economy. The question that arises is: What is the status of introducing such developments?

[Answer] Interaction between science and practice has developed into a multi-level system in our department. The "uppermost" level is represented by technical-economic reports on the largest developments to the USSR Gosplan. Since the end of 1979 we have submitted 20 reports of this sort. As a result of

work done in divisions of the USSR Gosplan and the State Committee for Science and Technology as well as in the corresponding ministries and departments, we have gone far ahead on the road to introducing a large number of developments into the national economy.

Significant corrections have been made in the strategy of increasing the explored reserves of oil and gas and expanding the raw material base for production of mineral fertilizers in Siberia.

Procedures for palladiumless metal plating of printed boards and isolation of concentrates from thermal waters, an aerosol process of using chemical resources offering protection against insect pests, catalytic heat generators and many other projects are now in various stages of preparation for experimental industrial production. The USSR Gosplan actively supported our proposal to apply radiation technology to various sectors of the national economy.

[Question] And what is the next level?

[Answer] The next level is represented by coordinated programs of research and introduction on a cooperative basis with ministries and departments. In this area our department has discovered a number of channels of interaction with the national economic sectors, it has created an efficient system for summarizing results and developing new plans, and it has organized an exchange of information on the scientific achievements and on the needs of the appropriate industrial sectors. These are very important and productive ties.

A so-called "introduction belt" consisting of sector scientific research institutes and design offices has been created in the vicinity of the academy's research station in Novosibirsk. Owing to their interaction with academy institutes, the application of the results of fundamental research in industry is accelerating significantly. Novosibirsk industry has already given life to many developments of our scientists. Thus a blast stamping method developed by our department's Institute of Hydrodynamics was tried out for the first time in Novosibirsk at the Plant imeni V. P. Chkalov. Now it is used extensively in the sector. Or consider the manufacture of complex shaped articles from sheet metal by pressing in creep conditions, creation of vibration-safe tools and machines, blast welding and so on.

[Question] You have talked about many of the results of scientific research that have already enjoyed practical use or are now being introduced into the national economy. The "Sibir'" program enjoyed an especially vivid response from the scientific world. As we know, this program reflects the most important national economic problems of Siberia's development. Could you say something about how certain provisions of this program are being realized today?

[Answer] The "Sibir'" program has made it possible to take a new step forward in the 10th Five-Year Plan in strengthening the ties between science and the national economy. "Sibir'" is an entire complex of 40 specific-purpose scientific programs devoted to the study and effective use of fuel, energy, minerals, raw materials and biological resources, to environmental protection, to complex technical and technological problems of Siberia and to formation of territorial-production complexes.

"Sibir'" includes an integrated program of scientific-technical progress in the country's future as a separate regional subdivision.

The main directions of research being conducted according to the "Sibir'" program reflect the tasks of the economic development of the country and its eastern regions. But in terms of a number of important problems our efforts must be significantly intensified and expanded. It is now in the country's interest to deepen certain areas of the program. While at first it was oriented on implementing developments already at hand, with time it became clear that this was not enough.

Take as an example the problem of obtaining liquid fuel from coal and gas. Or the large complex of issues associated with the economic, ecological and social consequences of diverting part of the discharge of Siberian rivers to the country's southern regions.

To solve these and other major problems, the Siberian Department initiated extensive research, and it is even creating new scientific institutions.

As we know, the famous Kansk-Achinsk coal basin is in Krasnoyarskiy Kray, and only partially in Kemerovskaya and Irkutskaya oblasts. This is why the Institute of Chemistry and Chemical Technology was organized in Krasnoyarsk. Its purpose is to provide a scientific base for creating new production processes in coal chemistry. The problems of developing the natural resources of Ural, which are very important to our country, are to be solved by a complex institute being created in Chita.

But it should not be thought that the efforts to complete the network of the academy's subdivisions have been finished. There is now a need for creating an academy-sponsored scientific base in Tyumen'. The genetics center being organized in Altay requires sizeable capital investments. And in general the problems of personnel, finances and equipment for young subdivisions of our department are rather acute. Unfortunately the solution to these problems depends on much more than just the Siberian scientists alone.

[Question] Valentin Afanas'yevich, is it not true that these problems could be solved in part by improving the system of planning and organizing your scientific research?

[Answer] Yes, this means of raising the effectiveness of scientific research was pointed out at the 26th CPSU Congress. And the Presidium of the Siberian Department instructed the executives of all of its institutes, the scientific councils and the joint scientific councils to once again attentively examine the subject matter of their scientific projects. The goal of this suggestion was to reduce the number of unpromising topics and thus transfer energies and assets to more important directions of fundamental and applied research. But maximum caution must be displayed.

Evaluating the importance of a project, the main thing is to keep from making mistakes, from basing decisions only on the possible benefit research might produce today. The future prospects of research must be determined from the standpoint of the fundamental nature of the problems being studied, and we must support collectives that have ventured into the unknown or are preparing to do so.

And of course, the most powerful factor promoting intensification of science is the training and proper placement of highly qualified personnel. We cannot of course plan the birth of a scientific genius who could provide nontrivial solutions to problems. It is all a matter of chance, even though it may be prepared for by the entire course of scientific development. But we are obligated to create conditions promoting not only the manifestation of the talent of a genius but also revelation of the capabilities of each person coming to science.

An entire system of training of personnel for science and the higher school has been created in our department with the active participation of one of its founders, Academician M. A. Lavrent'yev. This system includes work with schoolchildren, college students and young scientists.

Together with the Ministry of Education we are conducting school olympiads in mathematics, physics and chemistry, acquainting, by this and other means, gifted schoolchildren of Siberia and the Far East with the modern fundamentals of the sciences; we invite them to study in a special boarding school created at the Novosibirsk State University.

In order that students of the Novosibirsk University could assimilate their future specialties better, in their last years they work 2 days a week in the academy's institutes. The research they do is used as a learning tool. And concurrently science benefits. Our department submits 200-300 articles and inventor's certificates associated with diploma and course projects each year to the press and to the USSR State Committee for Inventions and Discoveries.

A joint order of the board of directors of the RSFSR Ministry of Higher and Secondary Specialized Education and the Presidium of the Siberian Department of the USSR Academy of Sciences has designated the Novosibirsk State University imeni Leninskiy Komsomol as the principal institution of higher education for improving the forms of interaction between the higher school and the academy's science effort in the Russian Federation.

The experience of the Novosibirsk State University's interaction with academy institutes is being utilized and developed in other scientific centers of the department.

[Question] Now this question. We know that mathematics--development of mathematical theory and its broad use for applied purposes--is now thought to play an important role in intensification of science. Tell us, at least briefly, about the work of Siberian mathematicians.

[Answer] Mathematical models of complex processes and phenomena, which are representatives of a unique form of mathematical technology, are a very promising direction in modern science. Such models make it possible to intensify applied research and accelerate experimental design work.

Our institutes have accumulated significant experience in this area. Computer centers in Novosibirsk and Krasnoyarsk have done much to create algorithms for controlling complex systems and processing aerial photography and geophysical

information. Our department's Institute of Theoretical and Applied Mechanics has created packages of application programs broadly employed in the design of new models of equipment. These programs help to save much time and effort spent in the testing of models.

Examples of things you may be aware of include the mathematical model of interaction between the atmosphere and the ocean at the Computer Center, a model of an energy system at the Siberian Power Engineering Institute, models of chemical reactors at the Institute of Catalysis and so on.

Mathematical technology is a very effective means of solving the problems of automating planning, design and scientific research work using computers.

[Question] Valentin Afanas'yevich, we know that you, in your work at the Novosibirsk Institute of Organic Chemistry, initiated and have taken charge of a completely new direction in chemistry--use of computers in spectroscopy and chemical research. Work being done under your guidance in the use of computers to solve the problems of organic chemistry is well known not only in our country but also abroad. Use of computers to improve information support to research is said to be enormously significant today. What can you say in this regard?

[Answer] Use of computers in scientific research is also a way to intensify science. The amount of information being accumulated in different areas of knowledge is growing. And it is growing so swiftly that even the enormous network of sector and state centers of scientific-technical information cannot satisfy the growing demands of users.

We are now creating a network of automated information centers possessing their own data banks. These centers will be combined into a single information and computer network of the country. It will provide direct access of users to all data banks. There are, of course, tremendous reserves here for raising the labor productivity of scientists, engineers and technicians.

Let us look at an example you yourself brought up--the scientific information center on molecular spectroscopy of the Novosibirsk Institute of Organic Chemistry. An automated computerized complex collecting and storing information on the structure and physicochemical properties of organic compounds has been created here. This information is manipulated by computers.

Assume that a researcher comes up with a chemical compound of unknown structure. He often has to work several months to establish the structure of the substance. But a computer that can compare the physical (for example spectral) or chemical characteristics of a substance with previously accumulated characteristics of other substances can help the chemist solve this problem in a few minutes or hours.

Another task, synthesizing a substance with particular properties, is also one encountered extremely often. Here again a lengthy exhaustive search procedure is usually involved. Tens and hundreds of combinations must be tested, and one after the other the proposed variants are rejected. A computer, it turns out, can successfully do this task as well--propose a plan for creating a particular molecular structure to the chemist.

It should be noted in general that mathematization and automation of scientific research is a typical feature, and I would even go so far as to say that it is an important trend of modern knowledge. This is why Novosibirsk philosophers are looking very seriously at problems associated with logical-mathematical analysis of knowledge.

[Question] You have turned the discussion to philosophers. Not accidentally, I am sure. Methodological and philosophical aspects of the development of science occupy an important place in the formation of our society's scientific potential. The Novosibirsk Scientific Center--a unique capital of the Siberian Department--is one of the largest complexes of research on scientific knowledge in the country and abroad. What is the role of philosophers in this complex system which we refer to simply as Siberian science?

[Answer] There was obviously good reason for selecting the philosophical and methodological problems of the natural sciences as the principal subject to be studied by the philosophers of our department. Today the sole possible way of arriving at philosophical generalizations in the natural sciences is through collective effort, through development of common points of view on the basis of the sum total of knowledge.

Philosophy seminars have become an important element of such interaction in the Siberian Department. They are regularly conducted at the Novosibirsk Scientific Center, and they are devoted to methodological problems of social and natural sciences.

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OPERATING BIOCHEMICAL PLANT USING PUNCH CARD CONTROL PANELS

Moscow GIDROLIZNAYA I LESOKHIMICHESKAYA PROMYSHLENNOST' in Russian No 4, 1982 (signed to press 13 May 82) pp 5-9

NOVIKOV, G. P. and SIZOV, V. V.

[Abstract] In applying mini- and microcomputers to controlling production processes at small and medium-size plants, the authors stress the need for simplicity and economically-applied techniques and methods. Overemphasis on automation and neglect of punch card control has limited the effectiveness of these modern innovations. The authors propose a system that in their view covers overall control, basic and auxiliary production, economic and social functions. They stress the need for additional information and rationalization of control procedures. Specifically, they recommend that every director have a bank of information providing all necessary data for his particular operation, at each subsequent level of complexity. The basic information nucleus should be in punch card control panels based on an immediate card retrieval system. Indexing and the scope of information presented on each card is summarized. The system has been implemented at the Manturovskiy Biochemical Plant in recent years, but has had little effect on decisions at the plant. Salary and other bookkeeping procedures are being done, but more work is needed. Advances include implanting control technology and thereby making time available for creative and analytical pursuits, increased reliability of information, better communication between plant units, reduced losses in implementing aspects of the card control approach, and simplicity and accessibility. Figures 2, references 4: 3 Russian, 1 English.

[255-12131]

UDC 630\*863.1 : 658.62.018 12

ADOPTION AND USE OF AUTOMATIC SYSTEM OF CONTROL OF PROCESSES AT KIROV  
BIOCHEMICAL PLANT

Moscow GIDROLIZNAYA I LESOKHIMICHESKAYA PROMYSHLENNOST' in Russian No 4,  
1982 (signed to press 13 May 82) pp 20-21

KUIMOV, M. Ya., engineer

[Abstract] Automation to produce 60,000 tons of yeast annually involves 2 M-6000 computers and auxiliary equipment to control 6 sub-operations: "feed" (preparation of nutritive salts and lime milk), "thickening" (preparation of biomass by separation and evaporation), "hydrolysis," "fermentation," "substrate" and "furfural" subsystems complete the process. Along with these separate steps in production, the computers also monitor equipment status and technical and economic parameters of production, using disc actual operation-time methods. Beginning in 1978, with the aid of several specialized institutes the plant gradually expanded its computerization. Information shortcomings have greatly restricted the economic effectiveness of the project. Production tests with hand-feeding of information began in 1980, and further additions to the system are to continue until 1984. Poor preparation, imperfection in the project plan, delivery delays of special measuring equipment and lack of close communications with the sponsor, the All-Union Biotechnical Scientific Research Institute, have all contributed to poor performance thus far. Lack of suitably-trained personnel has been another drawback, and a final important hindrance has been the lack of replacement parts when the equipment frequently broke down.

[255-12131]

UDC 662.74.001.83

COLLABORATION OF SCIENCE AND PRODUCTION

Moscow KOKS I KHIMIYA in Russian No 6, Jun 82 pp 4-5

RUDKEVICH, M. I., candidate of technical sciences, Coal Chemistry Scientific Research Institute

[Abstract] The author summarizes the Institute's involvement in basic research and the development of scientific technical processes that can readily be incorporated into production, through its contracts with nearly all the coke chemistry plants in the Ukraine as well as with metallurgical and machine building enterprises. It has prepared plans for various coke production lines, for improved evaluation of hydrogen purity for internal combustion engines, for producing superplasticizers for concrete and coal-tar modifiers for polyethylene. It has served as consultant for coal pulverizing innovations at the Donets Coal Tar Chemical Plant and for numerous primary metallurgical

organizations. Effective work in the Institute has been tied directly to wages. In the period 1976-1980, the Institute staff received 210 patents and 24 foreign patents; their exhibits at the Ukrainian and USSR Economic Exhibits earned 37 medals and certificates.

[254-12131]

UDC 662.74 : 547.53.067.8

PERFECTING TECHNOLOGY OF SULFURIC ACID PURIFICATION OF BTK FRACTION AT  
GUBAKHINSKIY COAL TAR CHEMISTRY PLANT

Moscow KOKS I KHIMIYA in Russian No 6, Jun 82 pp 23-25

TITUSHKIN, V. A., FROLOVNIN, Yu. V. and CHAYSKIY, V. Ya., All-Union Coal Tar Chemistry Scientific Research Institute; DONTSOV, Yu. G., ZHITNIKOV, P. M. and ZHUKOVSKAYA, R. P., Gubakhinskiy Coal Tar Chemical Plant

[Abstract] Variations in the raw benzene received from three separate sources require variation in processing technology to obtain good quality "BTK" benzene at the Gubaklin plant. These sources of raw benzene are: i) that plant itself; ii) pyrolyzed resin from synthetic-alcohol plants; and iii) low-sulfur raw benzene from other coal-tar enterprises. The authors purified three BTA fractions; viz., its own BTA fraction, a 3 : 1 mixture of BTA fractions from its product and pyrolyzed resin and a 9 : 11 mixture of its BTK product and low-sulfur benzene, with an added 8-10% pyrolyzed resin. Purification involved 92-94% by mass of sulfuric acid, a contact time of 10 minutes, and sulfuric acid and piperylene fraction flow at 9-17 and 1-6% respectively of the fraction, depending on the exact mix. Results showed that at these parameters any of the initial input raw materials produced standard quality benzene "for nitration." Further data were collected on boiling points and bromine number (elevated from 0.09 to 0.15 g/100 ml) and crystallization temperature (reduced to  $\leq 5.15^{\circ}\text{C}$ ). Further processing at the rectification stage does improve the benzene properties.

[254-12131]

## COAL GASIFICATION

UDC 662.62

### MINERAL COMPONENTS OF COALS

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 3, May-Jun 82  
(manuscript received 26 Dec 80) pp 35-43

SHPIRT, M. Ya., Institute of Combustible Minerals

[Abstract] Study of mineral components of coal other than its organic mass has included geochemical features of formation and conversion, methods for determining composition and properties, and creation of processes for using organic and mineral components of solid combustible minerals. The present report analyzes the results of studies of mineral component properties and their conversions during coal processing. Nearly all elements except for inert gasses, platinum group metals, technecium, and rare earth and radioactive elements are found in coals and shales, which seem to be natural concentrators of elements. The author stresses on macrocomponents that have been studied by petrographic and chemical methods, in the categories of oxides, aluminosilicates, carbonates, sulfides, sulfates and chlorides, and organic minerals. Various data indicate that solid combustible ores are not a crude mechanical mixture of organic and mineral substances, but complex compositions in which mineral components have a significant impact on storage and processing. Enrichment of coals and shales depends in many ways on clay substances they contain. Liquid phase hydrogenation can produce liquid organic and organic-mineral products and leave mineral components as solid products. A brief discussion of microcomponents touches upon efforts to remove harmful elements and recover valuable ones in thermal processing of coals and shales.

References 26: 18 Russian, 8 English.

[246-12131]

## COMBUSTION

UDC 541 (126 + 64) : 547.241

### COMBUSTION FEATURES OF COMPOSITIONS OF POLYMETHYLMETHACRYLATE WITH CERTAIN PHOSPHORIC ACID ESTERS

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 24, No 4, Apr 82  
(manuscript received 4 Jan 81) pp 864-869

RAZINSKAYA, I. N., SUMENKOV, K. F., PLAKSINA, N. L., LIKHTEROV, V. R.,  
POMERANTSEVA, E. G. and SHTARKMAN, B. P.

[Abstract] In combination with PMMA, the title esters assure high opacity and reduce flammability. The authors studied such mixtures to determine their role in fire resistance of the polymer, using tris-(2-chloroethyl)phosphate with tris-(1 methyl-2-chloroethyl)-phosphate, and phenyl-bis-(2-chloroethyl)phosphate with phenyl-bis-(1-methyl-2-chloroethyl)phosphate. The oxygen index, used as an indicator of fire resistance, indicated that the second and fourth phosphates were the most effective antipyrenes for addition to PMMA. The more tris-(2-chloroethyl)phosphate added to the composition, the more oxygen it held and hence, the higher its rate of combustion. Exchanging a primary alcohol radical for a secondary one in phosphoric acid esters increased their fire-extinguishing properties for PMMA, regardless of decreases in their phosphorus and halogen content. Gaseous products of pyrolysis contained the initial antipyrenes as well as chlorine-containing products of thermal decomposition, indicating a cooling role for the phosphates. Their chemical structure had a key role in combustion. Figures 6; references 12: 11 Russian, 1 English.

[228-12131]

UDC 541.141.1

### PHENOMENOLOGICAL COMBUSTION MODEL IN LOW TEMPERATURE CHEMICAL REACTIONS

Moscow KHMICHESKAYA FIZIKA in Russian No 5, May 82 (manuscript received 22 Oct 81) pp 685-691

BENDERSKIY, V. A., MISOCHKO, Ye. Ya., OVCHINNIKOV, A. A. and FILIPPOV, P. G., Department of the Institute of Chemical Physics, USSR Academy of Sciences, Chernogolovka Division

[Abstract] Previously the authors showed that at helium temperatures in saturated hydrocarbons containing chlorine, combustion occurs upon cooling

after preliminary photolysis creates critical radical concentrations. Data indicate that a supplementary parameter is involved relating to mechanical properties of the matrix and the linking rate. The model developed to demonstrate this is based on the hypotheses that part of the reaction's heat effect is expended to create tensions that relax in proportion to increasing temperature, and combustion occurs almost isothermally and creates deformations that in turn increase the reaction rate constant. Low-temperature and high temperature phenomena are discussed. Increasing temperature causes simultaneous growth and speed of reaction and of relaxation, and the latter in turn slows the reaction. Thus heat and deformation combustion are characterized respectively by low temperature and high temperature extremes. Figures 5; references 11: 8 Russian, 3 Western.

[235-12131]

UDC 536.46 - 546.27

#### LIMITING STAGE IN BORON OXIDATION IN COMBUSTION PROCESSES

Moscow KHMICHESKAYA FIZIKA in Russian No 5, May 82 (manuscript received 26 Nov 81) pp 692-697

GRIGOR'YEV, Yu. M. and SAFANEYEV, D. Z., Department of the Institute of Chemical Physics, USSR Academy of Sciences, Moscow

[Abstract] Knowledge of the vaporization mechanism of a  $B_2O_3$  coating is necessary to interpret the combustion mechanism of boron particles in media containing oxygen. Since previous research has given contradictory results, the authors made direct measurements of the vaporization rate under controlled conditions by heating boron threads electrically in argon to a constant temperature and holding them for various periods, after oxidizing the threads to obtain about 5  $\mu m$  coating of  $B_2O_3$ . Evaluation of changes in the coefficient of convective heat loss showed that only insignificant amounts of  $B_2O_3$  evaporated. An electrothermographic method was used to show that there was little difference in integral radiation capability with the boron oxide coating and without it. Evaporation was judged to be steady, without sudden variations, as shown by electric power measurements of the boron thread. For practical purposes a diffusion-controlled evaporation theory can be applied to  $B_2O_3$  evaporation. Figures 3; references 19: 13 Russian, 6 Western.

[235-12131]

## EXPLOSIVES AND EXPLOSIONS

UDC 66.095.83

### REDUCTION AMINATION OF ISOBUTYRIC ALDEHYDE TO ISOBUTYLAMINES IN PRESENCE OF VARIOUS HYDROGENATING CATALYSTS

Leningrad ZHURNAL PRIKLADNOY KHMII in Russian Vol 55, No 5, May 82  
(manuscript received 4 Aug 80) pp 1122-1126

SMAYEVA, T. P., YAKUSHKIN, M. I., AKULOVA, N. G., BAZYLEV, R. V. and LEBEDEVA, N. V.

[Abstract] The title amination is promising due to the rapid growth of the oxosynthesis industry, since the isobutylamines obtained can then be used to produce new surface-active substances and additives for fuels and lubricants. To simplify the process, the authors conducted the amination at atmospheric pressure in the presence of both available and specially synthesized catalysts. At high temperatures, secondary and tertiary amines formed due to disproportionation of the primary amine. The process, which is summarized in the experimental section, allowed good aldehyde conversion with cobalt on aluminum oxide the best catalyst for monoisobutyl amine, rhodium on aluminum oxide and alumoplatinum best for diisobutyl amine, and palladium on carbon best for obtaining triisobutyl amine. A chromatographic analysis method for catalysts identified both intermediate products--secondary aldimines and isobutyronitrile--and the isobutyl amines. Figures 2; references 15: 6 Russian, 9 Western.

[251-12131]

## FERTILIZERS

### NEW MINERAL FERTILIZER PRODUCTION ASSOCIATION FORMED

Moscow MOSKOVSKAYA PRAVDA in Russian 30 May 82 p 1

[Article by Correspondent Yu. Fel'chukov, Press Center, Ministry of Mineral Fertilizer Production: "The Arsenal of the Harvest"]

[Text] At first glance the fields of the agrochemical experimental station of the Scientific Research Institute of Fertilizers and Insectofungicides (NIUIF) do not look any different from ordinary farm fields. But these fields are special--it is here that new forms of mineral fertilizers are given their first taste of life.

Incidentally, fertilizers undergo testing not only here near Moscow, but also in other climatic zones, in the most diverse soils beginning with chernozem and ending with desert sand.

The importance of this work can be compared, without stretching, to the work of breeders selecting new varieties. Just 100 kilograms of nitroaminophos can ensure a 4-7 centner increase in the yield of winter wheat and barley per hectare, even from the poor soils of the nonchernozem zone.

The experimental plots are in a sense the last step before the end of the long road from the laboratories of the scientists, through experimental production in "big chemistry," and then to the fields of the country. These fields are the culmination of the work of several organizations contained within the "Minudobreniya" NPO [Scientific-Production Association] of the Ministry of Mineral Fertilizer Production. It was created about 2 years ago, when three organizations, widely known not only in our country but also abroad and having more than a half-century history behind them, were brought together "under one roof." They include the NIUIF, which recently celebrated its 60th anniversary, "Giprokhim"--the master planner of practically all chemical industry enterprises in the USSR, and an experimental plant which was created back in 1929. Each subdivision of the "Minudobreniya" NPO has accumulated extremely rich experience and possesses highly skilled scientists, engineers, technicians and laborers. Their unification was a natural step: They had cooperated with each other to one degree or another for many decades, even though they had been organized separately and each had its own interests, which were not always consistent with the interests of their partners.

"Now the situation has changed," said the general director of the "Minudobreniya" NPO, A. A. Novikov. "We are successfully completing the first stage of

reorganization of all of the work, the main objective of which is to achieve close cooperation between the subdivisions, so that the achievements of science could be introduced into production faster. We can already see that a significant number of the disagreements which had formerly arisen between the researchers and planners for example, have resolved themselves. The ties of the researchers, planners and the experimental plant with industry have become closer."

In the first year of the five-year plan colleagues of the NIUIF completed their research plan ahead of schedule. It included 72 scientific developments requested by industrial enterprises and other organizations. In this case the scientists devoted their main attention to creating new forms of fertilizers and intensifying and improving production of phosphoric and sulfuric acids and feed phosphates using new technical concepts making it possible to significantly reduce consumption of raw materials, fuel and power and to protect the environment.

As an example the laboratory led by Doctor of Technical Sciences P. V. Klassen discovered production concepts making it possible for enterprises to reach their planned output--that is, to extract practically all of the initial raw material used to make phosphoric acid--in a relatively shorter time. Quite recently, meanwhile, extraction of just 70 percent was said to be a good result. Efforts aimed at introducing new forms of raw materials into production are no less significant to the national economy.

The collective of the experimental plant is working in close contact with the scientists. The reconstruction which ended in 1975 is referred to as a second birth. Today, one could only guess that this is a chemical enterprise by entering its bright, spacious shops, where the eyes are confused by a complex jumble of pipes and air ducts and where one sees carefully stacked sacks of finished products. In contrast on the outside there is a large rose garden, there are beds of peony and phlox, walnut trees line the lanes, and the fruit trees provide homes to noisy, busy birds. Nor is there "an odor" of chemistry here. Living nature--the best indicator--reacts keenly to any environmental contamination.

The activities of "Giprokhim" and its affiliates include integrated planning of enterprises producing sulfuric acid and phosphorus fertilizers. In accordance with party and government directives, the planners are concentrating their main efforts on rebuilding existing enterprises. As an example a plan for rebuilding the sulfuric acid production operations at the "Azot" Production Association in Rovno will make it possible not only to improve working conditions but also promote environmental protection. It is noteworthy that the sulfur the enterprise will be using in the future will be extracted from natural gas and petroleum. Thus it will transform from an undesirable impurity into a raw material.

And so, even a cursory acquaintance with the work of the "Minudobreniya" NPO would show that the collective is on the right road. But could the association work better under the new conditions, with an even greater payoff? Everyone I talked to replied in the affirmative. They named numerous causes of the most

diverse nature as the stumbling blocks. Included among them are problems which cannot be surmounted by the efforts of the collective alone, even though they do seriously retard not only the work of the particular subdivision but also the association as a whole.

Take as an example the experimental plant. Its name alone says something about the profile of this unique enterprise, and defines its main task--promoting transmission of scientific-technical developments born in the laboratories through experimental industrial production into industry. But for reasons having nothing to do with the workers of this production operation, things are not going as they should. The enterprise's plan places quantity uppermost: There are about 200 consumers awaiting and demanding its--repeat, its--products, since this plant has been designated as their supplier.

Thus a paradoxical situation has evolved: General-purpose experimental facilities created at the plant and offering a possibility for reducing testing time by several orders of magnitude are tied up in quantity production, while scientific developments requiring experimental testing not in the test tube but in real production facilities are slowly growing obsolete.

It is still early to make any generalizations--not enough time has passed since the association was organized. But we can boldly state that it is off to a good start. This is a dependable guarantee of forthcoming successes in the struggle to implement decisions of the May (1982) Plenum of the CPSU Central Committee and the directives and recommendations of Comrade L. I. Brezhnev. The yields at hundreds of the country's farms will depend in many ways on the work of the association's collective.

11004  
CSO: 1841/261

## FERTILIZER ASSOCIATION PLEDGES HIGHER OUTPUT

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 4 Jun 82 p 1

[Article by V. Morshanskiy, party committee secretary, "Kuybyshevfosfor" Association: "In Addition to the Plan"]

[Text] Our association has a direct relationship to implementing the decisions of the May Plenum of the CPSU Central Committee. We produce mineral fertilizers--the elixir of fertility.

New socialist pledges were adopted at a meeting of the active party members and administrators, in which the results of the plenum were discussed. They decided to surpass the production plan by 10,000 tons of mineral fertilizers and 70 tons of carbophos.

The association's products are in demand. Hothouses use its crystallin, and its phthalophos is a good agent against the Colorado beetle. Its nitrogen-phosphorus fertilizers are supplied to the fields of hundreds of kolkhozes and sovkhozes.

Plans have also been made to hasten development of the association's own subsidiary farm.

Fulfilling annual pledges adopted in honor of the 60th anniversary of the USSR's formation ahead of schedule: This is the slogan under which all of the association's subdivisions are competing.

11004  
CSO: 1841/261

UDC 631.84/85

OBTAINING 'CARBONITROPHOSKA' (CARBON, NITROGEN, PHOSPHORUS, POTASSIUM FERTILIZER)

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 55, No 5, May 82  
(manuscript received 15 Dec 80) pp 977-980

KOCHEMBA, Yu. I. and SHENKIN, Ya. S.

[Abstract] The common Soviet method for obtaining "nitrophoska" uses a mixture of nitric and sulfuric acids to decompose natural phosphate, with calcium nitrate or ammonium sulfate used to remove calcium. The authors propose nitric acid processing of phosphates in a method that avoids retrogradation of phosphorous anhydride and permits production of practically all the  $P_2O_5$  in a water-soluble form. This happens because in dissolving the fertilizer in water, urea nitrate enters the solution as nitric acid which breaks down finely-dispersed calcium phosphates into phosphoric acid. The present process obtains carbonitrophoska by breaking down natural phosphate with sulfuric and nitric acids, neutralizing the pulp with ammonia, mixing it with a solution of carbamide and potassium chloride, and then granulating and drying the product. The process reduces the pH of the pulp during ammoniation, cuts sulfuric acid use and uses carbamide in pulp neutralization. Production tests were successful, yielding high percentages of water-soluble  $P_2O_5$ . The "carbonitrophoska" practically did not differ in hygroscopicity from "nitrophoska," and was stored as long as 6 months with little change. Figures 2; references 6 (Russian).

[251-12131]

UDC 546.171.1'185 : 542.936

DEHYDRATION KINETICS OF MONOAMMONIUM PHOSPHATE AND AMMONIUM POLYPHOSPHATES

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 55, No 5, May 82  
(manuscript received 3 Apr 80) pp 1148-1153

RILO, R. P., KULIKOV, B. A. and KAGANSKIY, I. M.

[Abstract] In obtaining liquid fertilizers by high temperature ammoniation of extraction phosphoric acid, the best method involves the reaction through

formation of monoammonium phosphate followed by dehydration. Since there are contradictions about this process in the literature, the authors studied the degree of dehydration according to a material balance formula that agreed with the process's chemical mechanism, and was more precise than approaches that do not consider the distribution of individual forms of condensed phosphates and the degree of ammoniation. Studies were made of the title phosphates in temperature intervals from 80 to 650°C. Thermographic results at the various temperatures are summarized. Results showed four stages of mass loss: insignificant losses up to 180°C (0.2-1.5%); more intensive decomposition at 440-475°C with 25% mass loss and the formation of ring phosphates; reduced rate of loss at 475-622°C with 33% total loss, and practically complete evaporation of azeotropic mixtures at 622-740°C. The thermal decomposition and polycondensation was more intensive for monoammonium phosphate. Figures 5; references 16: 10 Russian, 1 Polish, 4 Western.  
[251-12131]

UDC 541.123

#### SOLUBILITY IN $\text{NH}_4\text{H}_2\text{PO}_4$ - $(\text{NH}_4)_2\text{H}_2\text{P}_2\text{O}_7$ - $\text{H}_2\text{O}$ SYSTEM AT 0°

Leningrad ZHURNAL PRIKLADNOY KHMII in Russian Vol 55, No 5, May 82  
(manuscript received 30 Jun 80) pp 1153-1154

KUZNETSOVA, A. G. and IL'INA, T. L., Chemico-Technological Institute imeni D. I. Mendeleyev, Moscow

[Abstract] The title system is found among the salts that make up complex liquid fertilizers. The authors studied its solubility by an isothermal method at 0°C using monoammonium phosphate, diammonium pyrophosphate and tetraammonium pyrophosphate. Paper chromatography showed the absence of salts with a greater degree of dehydration. The data obtained show that until the liquid phase contains up to 19.5% diammonium pyrophosphate, the solubility of  $\text{NH}_4\text{H}_2\text{PO}_4$  remains essentially constant. Higher concentration of  $(\text{NH}_4)_2\text{H}_2\text{P}_2\text{O}_7$  bring reduced solubility of monoammonium phosphate. The proportions of these two phosphates in the system determine the nutrient content of the fertilizer, with the maximum (40.6%) nutrient level at the eutonic point. Figure 1; references 6: 5 Russian, 1 Western.  
[251-12131]

HYGROSCOPIC PROPERTIES OF NEW FORM OF NKMg-FERTILIZER 'NITROKALIMAG'

Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 55, No 5, May 82  
(manuscript received 14 Jul 81) pp 1157-1159

SOKOLOV, I. D., CHEREMNYKH, L. M., SAFRYGIN, Yu. S. and ANDREYEVA, N. K.,  
All-Union Scientific Research and Planning Institute for Halurgy

[Abstract] The Institute has developed the title fertilizer based on nitric acid break-down of polyhalite ores; the authors present the results of hygroscopic studies that are essential in organizing industrial production and agricultural application. The coefficient of hygroscopicity, expressed as a tangent of the slope of the kinetic curve of moisture sorption at the start of the test, was determined for "nitrokalimag" composed of 55.77%  $\text{KNO}_3$ , 42.48%  $\text{Mg}(\text{NO}_3)_2$ , and 1.75%  $\text{CaSO}_4$ . Results showed that the critical humidity at 25% for the compound was 56.0%, and the coefficient of hygroscopicity at 81.0% humidity was 9 millimoles. These factors must be considered in storing and transporting the fertilizer. Figures 6; references 11: 9 Russian, 1 Polish, 1 Czech.

[251-12131]

## NITROGEN COMPOUNDS

UDC 547.234.1 + 547.241 + 541.127

### QUANTITATIVE EVALUATION OF ALPHA-EFFECT IN HYDRAZINE DERIVATIVE REACTIONS WITH CERTAIN SUBSTRATES

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHMICHESKAYA  
TEKHOLOGIYA in Russian Vol 25, No 4, Apr 82 (manuscript received 1 Jul 80)  
pp 419-422

YANCHUK, N. I., Department of Organic Chemistry, Ternopol' State Pedagogical  
Institute imeni Ya. A. Galan

[Abstract] The authors studied the alpha-effect in reactions of mono- and disubstituted hydrazine derivatives with phenylisocyanate, phenylisothiocyanate and picryl chloride, and compared the reactivities and structures of the products. The alpha-effect, a positive deviation of the alpha-nucleophile point from the Brønsted line for compounds with usual reactivity, was determined quantitatively as the relation of alpha-nucleophile constant of reaction rate and of the primary arylamine of equal basicity. Data showed that the highest alpha-effect was with monosubstituted hydrazine derivatives in reactions with phenylisocyanate. In descending order, reaction capacity followed the order of hydrazides of aromatic carboxylic acids, of aliphatic carboxylic acids, sulfo acids, diarylphosphonic acids, 0,0-diarylphosphonic acids, 0,0-diarylthiophosphoric acids, arylhydrazides, and the least reactive, hydrazides of aromatic thiocarboxylic acids. The alpha effect's appearance depended on both the nature of the nucleophile reagent and of the substrate, and was conditioned by the reaction's mechanism. References 23: 17 Russian, 6 English.

[244-12131]

## ORGANOMETALLIC COMPOUNDS

UDC 547. (245+246+258.2)

### SYNTHESIS OF BIHETEROORGANIC OXIDES OF TIN, GERMANIUM, AND SILICON AND THEIR REACTIONS WITH BENZENESULFONYLISOCYANATE

Leningrad ZHURNAL OБSHCHEY KHMII in Russian Vol 52, No 5, May 82  
(manuscript received 18 Aug 81) pp 1190-1194

MYSIN, N. I., DERGUNOV, Yu. I., VODOP'YANOV, V. G., GEREKA, V. F. and YURKOVA, N. N.

[Abstract] Descriptions are provided of the reactions of  $\text{Et}_2\text{NMe}_2$  (M = Ge, Sn) type heteroorganic amines with triethylsilicon (or germanium) hydroxide, which proceeded initially at 40°C and then exothermically to give both high yields of biheteroorganic oxides and diethylamine. The biheteroorganic oxides of silicon, germanium, and tin reacted at -10°C with benzenesulfonylisocyanate under equimolar conditions to yield unstable biheteroorganic derivatives of arylsulfonylcarbamates; only the N-triethylgermanium-N-phenylsulfonyl-0-triethylsiliconcarbamate remained stable at temperatures approaching 80°C. Reaction of triethylsiliconoxidetriethylgermanium with phenylsulfonylisocyanate in 1:2 ratio yielded N-triethylsilicon-N'-triethylgermanium-bis(Phenylsulfonyl)urea. References 6: 3 Western, 3 Russian.  
[253-12172]

UDC 542.91 : 541.124 : 541.49 : 546.92 : 546.98

### SYNTHESIS AND STUDY OF HYDRAZINE-N,N-DIACETATES OF PLATINUM (II) AND PALLADIUM (II)

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHMICHESKAYA in Russian No 4, Apr 82 (manuscript received 18 Nov 81) pp 780-783

ZHELIGOVSKAYA, N. N., SHCHELOKOVA, L. R., POPOV, L. V., GREVTSEV, A. M. and SPITSYN, V. I., Moscow State University imeni M. V. Lomonosov

[Abstract] In contrast to other compounds containing platinum (II) and palladium (II), their compounds with hydrazine-N,N-diacetic acid have received little attention. The authors synthesized these compounds as described in the experimental section, and studied their physicochemical properties. Both

metals and any halide groups in synthesized compounds were measured for the first time by reducing the compounds from solution with hydrazine-hydrate during prolonged boiling. Infrared spectra of the compounds indicate a transverse structure, while potentiometric titration showed that all H<sup>+</sup> atoms titrate in the acid range of pH 1-4, with inflections observed when 2 and 4 equivalent units of KOH were added. The ion force created by the basic electrolyte was sufficient to suppress hydrolysis. Halogen groups in the compounds were quite strong for given ion force levels. Physicochemical studies showed that hydrazine-N,N-diacetic acid combines with Pt(II) and Pd(II) as mono- and bidentate ligands, forming highly stable complexes with pronounced acidic properties. References 9: 5 Russian, 4 Western.  
[216-12131]

UDC 542.91 : 547.1'119

SYNTHESIS OF CERTAIN ARSENIC-CONTAINING ENINE DERIVATIVES OF DIHYDROPYRANE, DIHYDROTHIOPYRANE AND TATRAHYDROPYRIDINE

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHMICHESKAYA in Russian No 4, Apr 82 (manuscript received 28 May 81) pp 933-935

YAGUDEYEV, T. A., DZHAKIYAYEV, G. M., NURGALIYEVA, A. N. and GODOVIKOV, N. N., Institute of Heterorganic Compounds imeni A. N. Nesmeyanov, USSR Academy of Sciences, Moscow

[Abstract] The authors found a new convenient method for obtaining arsenic derivatives through the action of arsenic halides on acetylenides of alkali- and alkali- earth metals involving the reaction of Li-Al-organic enine complexes with phenyldichloroarsine. At 60-65° in pyridine or "TGF" [expansion unknown], the title compounds from corresponding enine derivatives, with an accompanying shift of one Cl atom. The reaction of dihydropyran with chloride derivatives also produced asymmetrical arsenic derivatives. Details of the procedures are given in the experimental section. References 4 (Russian).  
[216-12131]

UDC 541.49 : (661.9.321 + 546.18286.5)

REACTION OF PHOSPHORUS OXYTRIISOTHIOCYANATE WITH TITANIUM, ZIRCONIUM AND HAFNIUM TETRACHLORIDES

Kiev DOKLADY AKADEMII NAUK UKRAINSKOY SSR, SERIYA B: GEOLOGICHESKIYE, KHMICHESKIYE I BIOLOGICHESKIYE NAUKI in Russian No 3, Mar 82 (manuscript received 10 Dec 81) pp 46-48

SKOPENKO, V. V., corresponding member, UkrSSR Academy of Sciences, BRUSILOVETS, A. I. and SINKEVICH, A. V., Kiev State University

[Abstract] Previous studies had shown that phosphorus oxytriisothiocyanate, coordinating through oxygen, formed  $MC_4$ .20P(NCS)<sub>3</sub>. The present authors show

the synthesis and properties of  $MCl_4 \cdot OP(NCS)_3$  ( $M=Ti, Zr, Hf$ ) and  $TiBr_4 \cdot OP(NCS)_3$ . Synthesis was conducted in an atmosphere of purified argon, with the ligand being added to a solution or suspension of the halogenide in slightly excess quantities. Adducts were isolated during isothermal crystallization. X-ray phase analysis confirmed the uniqueness of the compounds, while cryoscopic determination of the molecular mass of  $TiCl_4 \cdot OP(NCS)_3$  in bromoform pointed to its dimer structure. Comparison of infrared and Raman effect spectra of  $[TiSi_4 \cdot OP(NCS)_3]$  indicated the presence of centers of symmetry related to the  $C_{2h}$  group point. References 4: 1 Russian, 3 English.  
[220-12131]

UDC 547.491.6'.246'.258.11

SYNTHESIS AND PROPERTIES OF CARBODIMIDES AND CYANAMIDES CONTAINING SILICON, GERMANIUM, LEAD AND TIN

Moscow USPEKHI KHIMII in Russian Vol 51, No 5, May 82 pp 848-878

GORDETSEV, A. S., KOZYUKOV, V. P., VOSTOKOV, I. A., SHELUDYAKOVA, S. V., DERGUNOV, Yu. I. and MIRONOV, V. F.

[Abstract] The authors review and categorize the literature published until 1980 on the synthesis, reaction capability, physicochemical properties and application of the title compounds. Under methods of synthesis, they discuss reactions of cyanamide and its derivatives with heteroorganic compounds such as di- and polysilylcarbodiimides and N-(tributylplumbil)carbodiimide, reactions of halogen cyanogens with silicon-containing amino derivatives, reactions involving ureas and thioureas, those involving metallized silylamines, decarboxylation of isocyanates, and other methods. NMR tests showed the possibility of obtaining asymmetrical silylgermylcarbodiimides. They discuss physicochemical and chemical properties dividing the latter into reactions involving cumulative carbodiimide bonds, and reactions accompanied by rupture of the nitrogen bond with another element. The latter category includes reactions with compounds containing a mobile hydrogen atom, those with halogens and halogen-containing compounds, and ones with thiourea and thioamide derivatives. Practical applications of heteroorganic carbodiimides and cyanamides include polymer synthesis and production of certain organic compounds and industrial chemicals. Carbodiimides containing silicon make insulating coatings, while those containing tin stabilize polyvinyl chloride compositions and catalyze urethane production. Tin-containing cyanamide derivatives are antibacterial, while those containing lead are antioxidants and oil additives. References 221: 73 Russian, 148 Western.  
[248-12131]

UDC 542.91:541.49:547.1'13

SYNTHESIS AND REACTIONS OF MERCURY BIS(BENZYLCHROMOTRICARBONYL)

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHMICHESKAYA in Russian No 5, May 82 (manuscript received 24 Jul 81) pp 1131-1134

RAZUVAYEV, G. A., ARTEMOV, A. N., KASATKINA, T. G. and POSELENOVA, Ye. N., Institute of Chemistry, USSR Academy of Sciences, Gor'kiy; Scientific Research Institute of Chemistry, Gor'kiy State University imeni N. I. Lobachevskiy

[Abstract] The title compound (I) can be prepared by the reaction of dibenzylmercury with the triaminochromotricarbonyl complex. Four reactions are considered. 1. Compounds of type (I) react with 2 equivalents of  $I_2$ , yielding mercuric iodide and the corresponding arylchromocarbonyliodide (II). Compounds of type (II) cannot be prepared by the direct reaction of the aryl iodide with the chromium hexacarbonyl complex. 2. Compounds of type (I) react with 2 equivalents of  $LiAlH_4$  reducing the mercuric ion to the elemental mercury and the arylchromocarbonyl complex. 3. Compounds of type (I) react with mercuric chloride forming the benzylchromotricarbonylmercuric chloride (III). 4. Compounds of type (I) react with cupric chloride forming a mixture of (III) and benzylchromotricarbonylchloride. Details of syntheses and structural confirmations are given. References 12: 7 Russian, 5 Western.  
[247-12027]

UDC 541.124:542.92:547.1'13

MECHANISM OF DECOMPOSITION OF ORGANOMETALLIC COMPOUNDS CONTAINING TRANSITION METALS AND ROLE OF INTERMEDIATE PRODUCTS AS CATALYSTS

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHMICHESKAYA in Russian No 5, May 82 (manuscript received 12 Jun 81) pp 1134-1147

DOLGOPLOSK, B. A., ORESHKIN, I. A., TINYAKOVA, Ye. I. and YAKOVLEV, V. A., Institute of Petrochemical Synthesis imeni A. V. Topchiyev, USSR Academy of Sciences, Moscow

[Abstract] In general, the title reaction proceeds through an organic derivative of the metal, such as during hydrogenation, dehydrogenation, skeletal rearrangement, or deuteroexchange reactions. Substituted Mo and W compounds usually decompose by  $\Delta$ -disproportionation with the formation of carbene and carbyne moieties. Benzyl-substituted neodymium and yttrium in THF quantitatively form carbonyl or carbynyl complexes. Trimethylsilyl-(germanyl)methyl-substituted W, Mo, Ta, Re, Nb, Rh, Pd and Pt form two types of carbene complexes:  $(CH_3)_3SiCH:$  and  $CH_2:$ . Benzylmagnesium chloride reacts with Mo, W, Re, Rh, Pt and Pd with the formation of significant amounts of toluol, a product of the  $\Delta$ -disproportionation of the benzyl group, and smaller amounts of stibine and tolane, products of recombination of the carbene and carbyne fragments. References 43: 29 Russian, 14 Western.  
[247-12027]

CERTAIN PROPERTIES OF DIALKYL CYANARSINES

Tbilisi SOOBSHCHENIYA AKADEMII NAUK CRUZINSKOY SSR in Russian Vol 104, No 2, Nov 81 (manuscript received 28 Nov 80) pp 345-348

GIGAURI, R. D., ROBAKIDZE, A. N. and GOGIASHVILI, T. M., Tbilisi State University (presented by corresponding member of the Academy L. M. Khananashvili on 24 Nov 80)

[Abstract] Up until the present a nitrile structure has been attributed to dialkylcyanarsines, but one of the authors had previously showed that diarylchloroarsines react with potassium cyanide to produce cyanarsines that do not have nitrile properties. The authors have continued that research using Grignard reagent, expecting to obtain ketones containing ammonia. In fact, the products obtained were asymmetrical tertiary arsines. The radical of the Grignard reagent did not affect the direction of the reaction. Element analysis, infrared spectra and countersyntheses showed that specific features of such products as dibutyl(p-ethoxyphenyl)arsine correspond to those obtained with Grignard reagent and dibutylcyanarsine. Data obtained and the behavior of secondary cyanarsines during hydrolysis indicated that in dialkyl(aryl)-cyanarsines the bond between the arsenic atom and the nitrogen atom of the cyanogroup forms isonitriles. Chemical details are presented. References 10: 9 Russian, 1 English.

[203-12131]

## ORGANOPHOSPHORUS COMPOUNDS

UDC 542.91:547.1'118

### REACTION OF TRIPHENYLPHOSPHINE WITH ORGANIC HYDROTRIOXIDES

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHMICHESKAYA in Russian No 5, May 82 (manuscript received 21 Oct 81) pp 1177-1179

SHERESHOVETS, V. V., GALIYEVA, F. A., SHAFIKOV, N. Ya., SADYKOV, R. A., PANASENKO, A. A. and KOMISSAROV, V. D., Institute of Chemistry, Bashkir Branch, USSR Academy of Sciences, Ufa

[Abstract] Examples of the title reaction are those of  $\alpha$ -hydroxyisopropylhydrotrioxide (I) and  $\alpha$ -hydroxyethylhydrotrioxide (II) with triphenylphosphine (TPP). The hydrotrioxides (HTO's) rapidly and quantitatively oxidize TPP and TPPoxide. TPP reacts on a 1:1 molar basis with hydroperoxides and ozonides; however, with ozone, the stoichiometry can vary from 1:1 to 2:1 depending on the initial TPP concentration. A method is developed for a quantitative determination of HTO's based on their reduction at  $-78^{\circ}\text{C}$  to  $0^{\circ}\text{C}$  by excess TPP and a subsequent measurement of the unreacted TPP. References 9: 2 Russian, 7 Western.

[247-12027]

UDC 541.67:541.63:547.1'118

### DIPOLE MOMENTS AND CONFORMATIONS OF BENZYLDIPHENYLPHOSPHINE OXIDES

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHMICHESKAYA in Russian No 5, May 82 (manuscript received 7 Sep 81) pp 1179-1180

ISHMAYEVA, E. A., TSVETKOV, Ye. N., STRELKOVA, Ye. N. and PATSANOVSKIY, I. I., Kazan' State University imeni V. I. Ul'yanov-Lenin; Institute of Physiologically Active Compounds, USSR Academy of Sciences, Chernogolovka

[Abstract] Dipole moments (DM's) measured for compounds of the type  $p\text{-XC}_6\text{H}_4\text{CH}_2\text{P}(\text{O})\text{Ph}_2$  are as follows: (I) - X=H, 4.24D; (II) - X=Me, 4.40D; (III) - X=NO<sub>2</sub>, 6.67D; and X=CN, 6.9D. Calculated DM values for the gauche and trans orientations of the C<sub>sp<sup>3</sup></sub>-C<sub>sp<sup>2</sup></sub> and P=O bonds respectively are 4.25 and 3.93; 4.12 and 4.12; 6.83 and 0.20; and 6.92 and 0.28D. As the volume of

the R substituent on the P atom in a series of compounds having the general form  $R_2P(O)CH_2Cl$  decreases, the conformational equilibrium shifts towards the trans form. For R=Me, 90% of the material is in the trans form. References 12: 11 Russian, 1 Western.

[247-12027]

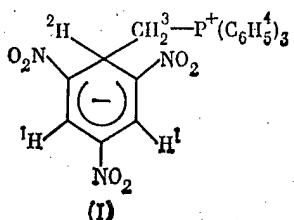
UDC 542.91:547.546:541.49:547.1'118

### INTERACTION OF 1,3,5-TRINITROBENZENE WITH SULFUR AND PHOSPHORUS YLIDES

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHMICHESKAYA in Russian No 5, May 82 (manuscript received 6 Jan 82) pp 1194-1195

YEGOROV, M. P., ARTAMKINA, G. A., BELETSKAYA, I. P. and REUTOV, O. A., Moscow State University imeni M. V. Lomonosov

[Abstract] The interaction of methylentriphenylphosphorane with 1,3,5-trinitrobenzene (TNB) in THF under an inert atmosphere at  $-5^{\circ}\text{C}$  to  $0^{\circ}\text{C}$  results in an unusual zwitterion  $\sigma$ -complex (I) having the structure



TNB also reacts with other ylides such as  $\text{Me}_2\text{SO}=\text{CH}_2$  and  $\text{Me}_3\text{P}=\text{CH}_2$  to form analogous products. The latter are brownish red crystals which are weakly soluble in THF. TNB is regenerated during acidification with HCl in methanol suggesting that the structural type is  $\text{Pic}^-\text{Kt}^+$  where  $\text{Kt}^+$  is  $\text{Me}_3\text{S}^+\text{O}$  or  $\text{Me}_4\text{P}^+$ . Some deprotonation of the TNB occurs resulting in the formation of  $\text{Ph}_3\text{P}=\text{CH}_2$ ; however, the yield of  $\text{Pic}^-(\text{Ph}_3\text{PMe})^+$  is about 20 to 30%, due to the differences in basicity and nucleophilic tendencies of the respective ylides.

References 1 (Russian).

[247-12027]

UDC 543.422.25:547.1'118

DIRECT OBSERVATION OF CONFORMERS OF 2-DIMETHYLAMINO-5,6-BENZ-1,3,2-DIOXAPHOSPHEPANE BY NMR

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHMICHESKAYA in Russian No 5, May 82 (manuscript received 12 Jan 82) pp 1195-1196

ARBUZOV, B. A., AGANOV, A. V., KLOCHKOV, V. V., KADYROV, R. A. and ARSHINOVA, R. P., Chemical Institute imeni A. M. Butlerov, Kazan' State University imeni V. I. Ul'yanov-Lenin

[Abstract] Compounds of the form 2-X-1,3,2-dioxaphosphepane, (for X=NMe<sub>2</sub> (I) and OPh (II)), exist as an equilibrium mixture of the chair form (C) and the twisted form (T). At 149°K, interconversion between the two forms is slow and NMR parameters can be attained for each of the two conformers. At 288°K, the NMR values represent an equilibrium between C and T forms. The following are values for 149°K (T form), 149°K (C form) and 288° C ⇌ T respectively: δ<sub>C</sub> (CH<sub>3</sub>) - 2.35, 2.69 and 2.60 m.d.; δ<sub>A</sub> - 4.98, 5.12 and 4.98 m.d.; δ<sub>B</sub> - 4.72, 4.49 and 4.81 m.d.; <sup>3</sup>J<sub>POCH</sub> (low field) - 10.3, 1.5 +1.5 and 7.3 hz; <sup>3</sup>J<sub>POCH</sub> (high field) - 15.5, 24.1 and 18.3 hz. The equilibrium constant for the C and T forms is equal to 1.8 + 0.2, ΔG<sub>C ⇌ T</sub> = 0.2 + 0.04 kcal/mole at 149°K. References 2: 1 Russian, 1 Western.

[247-12027]

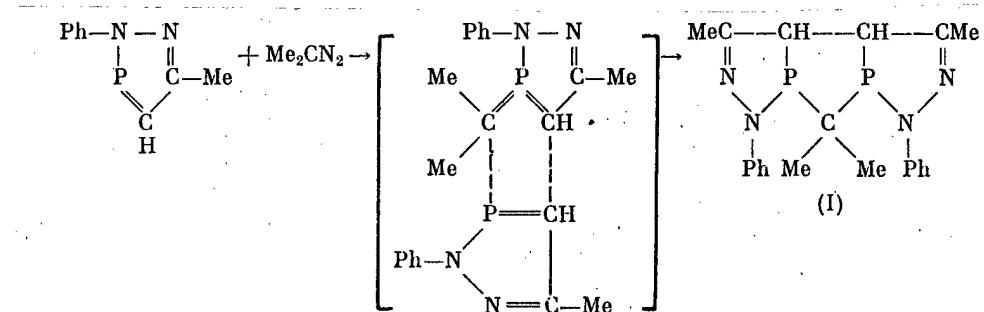
UDC 542.91:547.1'118:547.235.4

NEW PATHWAYS FOR REACTION BETWEEN DIAZAPHOSPHOLONES AND DIAZO COMPOUNDS

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHMICHESKAYA in Russian No 5, May 82 (manuscript received 12 Jan 82) p 1196

ARBUZOV, B. A., DIANOVA, E. N. and GALEYEVA, I. Z., Chemical Institute imeni A. M. Butlerov, Kazan' State University imeni V. I. Ul'yanov-Lenin

[Abstract] Stable di-ylide structures can be prepared by reacting compounds containing acyclic substituted dicoordinated phosphorus with diazo compounds. Cyclic substituents in the above P compounds exist only as intermediate products. For the reaction of 2-phenyl-4-methyldiazaphospholes and diazopropane, a 1,3-dipolar cycloaddition across the P=C bond is observed as shown below:



Experimental conditions and structural conformations are given. References 3:  
 2 Russian, 1 Western.  
 [247-12027]

UDC 541.127 : 542.938 : 547.1'118

ALKALINE HYDROLYSIS KINETICS OF *p*-SUBSTITUTED PHENYL ESTERS OF DIMETHYLTHION-PHOSPHONIC ACID IN WATER-ACETONITRILE MIXTURES

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHMICHESKAYA in Russian No 4,  
 Apr 82 (manuscript received 30 Jun 81) pp 868-871

ZHDANKOVICH, Ye. L., ISTOMIN, B. I. (deceased) and VORONKOV, M. G., Irkutsk  
 Institute of Organic Chemistry, Siberian Branch, USSR Academy of Sciences

[Abstract] Continuing their earlier studies of factors influencing nucleophilic substitution at the thiophosphinyl and carbonyl atoms, the authors studied a series of  $\text{Me}_2\text{P}(\text{S})\text{OC}_6\text{H}_4\text{X}-\text{p}$  esters in water-acetonitrile mixtures at 25° C, and compared the results with analogous data for phenylacetates of  $\text{MeC}(\text{O})-\text{OC}_6\text{H}_4\text{X}-\text{p}$ . Kinetics were studied in mixtures containing from 30 to 80 volume percent of MeCN. Measurements were made by spectrophotometry in pseudo-monomolecular conditions with a excess of NaOH. Data were processed by computer using a multidimensional regression analysis program. Results showed that with increased amounts of MeCN, the rate of hydrolysis of all esters drops sharply with the second compound. With the first, this dependence is more complex, with ester hydrolysis passing through a minimum value at about 50% MeCN content. The authors suggest that the anion  $\text{OH}^-$  attacks the phosphorus atom to generate the limiting stage in alkaline hydrolysis of thiophosphinates. Figure 1; references 6 (Russian).

[215-12131]

UDC 542.91 : 547.1'118

### THIOCYANIDES OF TRIVALENT PHOSPHORUS

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHMICHESKAYA in Russian No 4, Apr 82 (manuscript received 1 Sep 81) pp 939-940

PUDOVIK, A. N., ROMANOV, G. V. and VOLKOVA, V. N., Institute of Organic and Physical Chemistry imeni A. Ye. Arbuzov, Kazan' Branch, USSR Academy of Sciences

[Abstract] Chloranhydrides of thiophosphorous and thiophosphonic acids with trimethylsilylcyanide form corresponding cyanides of trivalent phosphorus. The authors produced previously unstudied thiocyanides of P(III), determining structures by infrared-, Raman effect- and nuclear magnetic resonance of  $^{31}\text{P}$  spectra, and compositions by element analysis. The experimental section gives details for producing dibutyldithiocyanophosphate, ethyl-S-isopropylthiocyanophosphonite, and S,S-dibutyl-(alpha-cyan-alpha-carbethoxy)dithiophosphite. Reference 1 (Russian).

[216-12131]

UDC 542.91 : 547.1'118

### REACTION OF ESTERS OF DIPHENYLTHIOPHOSPHONIC ACID WITH DIPHENYLCHLOROPHOSPHINE

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHMICHESKAYA in Russian No 4, Apr 82 (manuscript received 31 Jul 81) pp 951-952

AL'FONSOV, V. A., PUDOVIK, D. A., BATYYEVA, E. S. and PUDOVIK, A. N., Institute of Organic and Physical Chemistry imeni A. Ye. Arbuzov, Kazan' Branch, USSR Academy of Sciences

[Abstract] Since reactions of thioesters of phosphorus (III) with haloidophosphines had not previously been studied, the authors studied the reactions of the title compounds as derivatives of the same acid to avoid complicating the reaction with exchange processes between the thioalkyl group and the haloid. The reaction with thiophosphinite took place at 250° C without a solvent and brought formation of a mixture of tetraphenyldiphosphine, ethyldiphenylphosphine sulfide, and diphenylchlorophosphine sulfide. Nuclear magnetic resonance of  $^{31}\text{P}$  and thin layer chromatography also revealed small quantities of S-ethyldiphenyldithiophosphinate. The second title compound reacted less completely and had less effect on isomerization in a related experiment. Details are given in an experimental section. References 9: 3 Russian, 6 Western.

[216-12131]

OXIDATION REACTION OF PHENYLPHOSPHATE AND HYDROQUINONEPHOSPHATE CAUSED BY HYDROGEN PEROXIDE IN PRESENCE OF COPPER IONS

Kiev DOKLADY AKADEMII NAUK UKRAINSKOY SSR, SERIYA B: GEOLOGICHESKIYE, KHIMICHESKIYE I BIOLOGICHESKIYE NAUKI in Russian No 3, Mar 82  
(manuscript received 9 Nov 81) pp 40-42

MURADOV, A. Z. and YASNIKOV, A. A., corresponding member, UkrSSR Academy of Sciences, Institute of Organic Chemistry, UkrSSR Academy of Sciences

[Abstract] Seeking chemical models of biological conversions of phosphoric esters the authors studied the title reaction under aerobic and anaerobic conditions with 3.95 pH and temperature of 30-50° C. Oxidation speed was monitored by spectrophotometry and colorimetry: Spectral methods and thin layer chromatography revealed the formation of quinone in the reacting system. Small additions of allyl alcohol and acetonitrile markedly slowed the phenylphosphate reaction, while in anaerobic conditions quinone and hydroquinone speeded it. Results showed that phenylphosphate- $\text{Cu}^{2+}$ - $\text{H}_2\text{O}_2$  went through a stage in which hydroquinonephosphate formed. In a slow reaction,  $\text{CuO}^+$  forms and hydroquinonephosphate oxidizes. Quinone speeds the reaction and  $\text{Cu}^{2+}$  is formed. Figures 4; references 4 (Russian).

[220-12131]

INDUCTIVE EFFECTS OF PHOSPHORUS-CONTAINING SUBSTITUTES

Kiev UKRAINSKIY KHIMICHESKIY ZHURNAL in Russian Vol 48, No 4, Apr 82  
(manuscript received 6 Nov 80) pp 386-390

SUVALOVA, Ye. A., KASUKHIN, L. F., PONOMARCHUK, M. P., CHUDAKOVA, T. I., KLEPA, T. I., TUPCHIYENKO, S. K., DUDCHENKO, T. N. and GOLOLOBOV, Yu. G., Institute of Organic Chemistry, UkrSSR Academy of Sciences

[Abstract] Donor-acceptor properties of the radicals  $\text{R}_2\text{P}(\text{Y})-$  and  $\text{R}_2\text{P}(\text{Y})\text{X}-$ , where Y is a heteroatom or an undivided pair of electrons and X is a cross-linking fragment ( $\text{CH}_2$ , O, S, NR, etc.) are important for predicting reaction capability of organic phosphorus compounds in chemical and biological processes. To expand knowledge of these properties, the authors used the Staudinger reaction to analyze a series of derivatives of the radical  $(\text{EtO})_2\text{P}(\text{Y})\text{X}-$ , evaluating  $\sigma_{\text{I}}$  parameters and their dependence on the nature of X and Y groupings. In all cases the first stage of the reaction was limiting because of key reduction of PIII nucleophilicity by acceptor phosphorus-containing radicals. Thus all such substitutes are inductive electron acceptors.  $(\text{EtO})_2\text{P}(\text{Y})\text{O}$  substitutes were stronger acceptors than their nitrogen analogs. The structures of the compounds obtained were determined by PMR and  $^{31}\text{P}$  NMR, and infrared spectroscopy. Chemical details are given. References 18: 11 Russian, 7 Western.

[227-12131]

UDC 542.91:541.6:547.1'118

REACTION OF TRIMETHYLPHOSPHITE WITH p-DIMETHYLMINOBENZYLIDINE DERIVATIVES OF MONO- AND DICARBONYLIC COMPOUNDS

Leningrad ZHURNAL OБSHCHEY KHIMII in Russian Vol 52, No 5, May 82  
(manuscript received 8 Jun 81) pp 1024-1029

ARBUZOV, B. A., POLEZHAYEVA, N. A., GALIASKAROVA, R. T., AGANOV, A. V. and KHAYAROV, A. I., Scientific Research Chemical Institute imeni A. M. Butlerov of the Kazan' State University imeni V. I. Ul'yanov-Lenin

[Abstract] Conditions are described for the synthesis of phosphoranes by the reaction of p-dimethylaminobenzylideneacetone and -benzoylacetone with trimethylphosphite to yield 2,2,2-trimethoxy-3-p-dimethylaminophenyl-4-acetyl-5-methyl-1,2-oxaphosphalene and -5-phenyl-1,2-oxaphosphalene in the form of crystals with respective melting points of 83-88 and 103-108°C. The products were stable compounds which did not undergo transformation in betaines as seen with 1,3,2-oxazaphospha(P<sup>V</sup>)lenes and failed to alkylate tertiary amines. These benzylidene derivatives of the  $\beta$ -ketones react with  $P(OCH_3)_3$  in the presence of  $CH_3COOH$  to yield phosphonates. References 10: 2 Western, 8 Russian.

[253-12172]

UDC 547.491.6.26'118

REACTION OF DIALKYLCYANOPHOSPHITES WITH CARBONYLIC COMPOUNDS

Leningrad ZHURNAL OБSHCHEY KHIMII in Russian Vol 52, No 5, May 82  
(manuscript received 27 Mar 81) pp 1029-1032

PUDOVIK, A. N., ROMANOV, G. V. and VOLKOVA, V. N., Institute of Organic and Physical Chemistry, Kazan' Branch, USSR Academy of Sciences

[Abstract] Dialkylcyanophosphites were found to react with ketones only in the presence of catalytic quantities of triethylamine, with the formation of the corresponding dialkyl(-cyanoalkyl)phosphites. Furthermore, the catalytic effects of HCN were explained by the fact that the reaction initially involved the formation of cyanochydrin, which subsequently reacted with the cyano-phosphites in a nucleophilic substitution reaction with the regeneration of HCN. Figures 1; references 9 (Russian).

[253-12172]

$\sigma^\phi$ . CONSTANTS OF CYCLIC FRAGMENTS OF IMIDOPHOSPHORIC COMPOUNDS

Leningrad ZHURNAL OБSHCHEY KHMII in Russian Vol 52, No 5, May 82  
(manuscript received 23 Apr 81) pp 1033-1039

KABACHNIK, M. I., TIKHONINA, N. A., GILYAROV, V. A., KOROLEV, B. A.,  
PUDOVIK, M. A., KIBARDINA, L. K. and PUDOVIK, A. N., Institute of Heteroorganic  
Compounds, USSR Academy of Sciences; Institute of Organic and Physical  
Chemistry imeni A. Ye. Arbuzov, Kazan' Branch, USSR Academy of Sciences

[Abstract] Contradictions in the published data on the values of the constants of dioxaphospholane and dioxaphosphorinane fragments of imidophosphoric compounds led to the determination of these constants for the phosphorus-free fragments of 2-p-fluorophenylimino-1,3,2-dioxaphospholanes (on the basis of  $\delta_F$  values), and of 2-phenylimino- (or p-fluorophenylimino)-1,3,2-oxazaphospholanes and 2-dialkylamino (on the basis of  $pK_a$  ( $\text{MeNO}_2$ ) and  $F$  values). The  $\sigma^\phi$ . constants were found to vary with the reaction medium, which seriously limits the use of correlation analysis in the chemistry of the heterophosphoric ring. References 13: 1 Western, 12 Russian.  
[253-12172]

REACTION OF PHOSPHORYLATED ALLENES WITH SULFENYLCHLORIDES

Leningrad ZHURNAL OБSHCHEY KHMII in Russian Vol 52, No 5, May 82  
(manuscript received 2 Jun 81) pp 1040-1045

KHUSAINOVA, N. G., NAUMOVA, L. V., BERDNIKOV, Ye. A. and PUDOVIK, A. N.,  
Kazan' State University imeni V. I. Ul'yanov-Lenin

[Abstract] Since the interaction of sulfenylchlorides (I) with cumulene systems has not received adequate attention, this form of electrophilic addition was investigated by evaluating the effects of substituents on the phosphorus fragment and on the  $\gamma$  cumulene carbon in the reaction of I with phosphorylated allenes. Evaluation of the NMR and the PMR spectra demonstrated that, depending on the substituents, both linear and cyclic products are formed. The postulated mechanism involves an electrophilic trans-attack of I on the central carbon atom of the phosphorylated allene which is enhanced by the nucleophilicity of the phosphoryl group oxygen. This leads to the formation of a quasiphosphonium intermediate (II). A subsequent nucleophilic attack by the chloride ion on the electrophilic center of II determines whether a linear or a cyclic structure is formed, depending on the substituents. Figures 2; references 11: 1 Western, 1 Bulgarian, 9 Russian.  
[253-12172]

UDC 541.67:547.26'118

DIPOLE MOMENTS OF ORGANOPHOSPHORUS COMPOUNDS, PART 21: CONFORMATION OF ALLENYL DERIVATIVES OF TETRACOORDINATED PHOSPHORUS

Leningrad ZHURNAL OБSHCHEY KHMII in Russian Vol 52, No 5, May 82  
(manuscript received 7 Jul 81) pp 1045-1048

PATSANOVSKIY, I. I., STRELKOVA, Ye. N., ISHMAYEVA, E. A., REMIZOV, A. B., KHUSAINOVA, N. G., NAUMOVA, L. V. and PUDOVIK, A. N., Kazan' State University imeni V. I. Ul'yanov-Lenin

[Abstract] Investigations were conducted on the rotational isomerism of dimethyl(3-methyl-1,2-butadienyl)phosphine oxide, and 3-methyl-1,2-buta-dienephosphonate chloride and propanedieneephosphonate chloride, employing IR and Raman spectroscopies, evaluation of the dipole moments, and the Kerr effect. The resultant findings on the isomerism relative to the P-C(sp<sup>2</sup>) bond indicated that these compounds attain a cis-trans conformational equilibrium. Figures 1; references 22: 1 Bulgarian, 5 Western, 18 Russian. [253-12172]

UDC 547.76

2-ALKOXY(2-DIALKYLAMINO)-1,3,2-DIOXAPHOSPHOLENES

Leningrad ZHURNAL OБSHCHEY KHMII in Russian Vol 52, No 5, May 82  
(manuscript received 28 Jul 81) pp 1049-1054

KUDRYAVTSEVA, T. N., KARLSTEDT, N. B., PROSKURNINA, M. V., BOGANOVA, N. V., SHESTAKOVA, T. G. and LUTSENKO, I. F., Moscow State University imeni M. V. Lomonosov

[Abstract] Conditions are described for the synthesis and identification of 2-alkoxy- and 2-dialkylamino-1,3,2-dioxaphospholenes by the reaction of bis-1,2-trimethylsiloxyalkenes with alkyl dichlorophosphites containing a ring with a tri- or tetracoordinated phosphorus. The 2-alkoxy-1,3,2-dioxaphospholene products reacted poorly with electrophilic reagents (mercury oxide, isoamyl nitrite, iodobenzene, dimethyl sulfoxide). References 13: 5 Russian, 8 Western.  
[253-12172]

## EFFECTS OF SPATIAL HINDRANCE OF INTERACTION BETWEEN DIALKYLCHLOROPHOSPHINES AND THIOPHOSPHONOUS ACIDS AND THEIR SALTS

Leningrad ZHURNAL OБSHCHEY KHMII in Russian Vol 52, No 5, May 82  
 (manuscript received 20 Jul 81) pp 1054-1062

FOSS, V. L., KUKHMISTEROV, P. L. and LUTSENKO, I. F., Moscow State University imeni M. V. Lomonosov

[Abstract] Studies were undertaken to identify the most convenient approach for the preparation of tetraalkyldiphosphine monothiooxides ( $RR'P(S)PRR'$ ; I) and phosphonous acid thioanhydride ( $RR'P-S-PRR'$ ; II) isomers, which involved investigation of the following reactions: a)  $RR'PSNa + RR'PCl \rightarrow I$  and/or II; b)  $RR'P(S)H + RR'PCl \rightarrow II$  and/or I; and c)  $RR'P-PRR' + S \rightarrow I$ , where R and R' represent Bu, i-Bu, i-Pr, or t-Bu in various combinations. Since steric factors significantly influenced the thermodynamic stability of I and II, evaluation of spatial impediments in the kinetics between isomers was difficult because of possible mutual rearrangements in I and II, especially in the presence of thiophosphonous acid salts. The resultant analysis of the products showed that (c) was the most convenient approach for securing even the most unstable I compounds. Products prepared in this manner do not contain catalytic admixtures and can be stored for several months at  $0^{\circ}C$ . Synthesis in this manner is particularly significant because none of the I compounds, regardless of their thermodynamic stability, can be purified by distillation since heating leads to the establishment of a redox equilibrium. References 13: 5 Russian, 8 Western.

[253-12172]

## REARRANGEMENT OF THIOPHOSPHONOUS ACID ANHYDRIDES AND THEIR ISOMERIC TETRAALKYLDIPHOSPHINE THIOOXIDES

Leningrad ZHURNAL OБSHCHEY KHMII in Russian Vol 52, No 5, May 82  
 (manuscript 15 Jun 81) pp 1063-1067

FOSS, V. L., KUKHMISTEROV, P. L., and LUTSENKO, I. F., Moscow State University imeni M. V. Lomonosov

[Abstract] NMR- $^{31}P$  studies were conducted on a number of thiophosphonous acid anhydrides (I) and tetraalkyldiphosphine thiooxide isomers (II) to determine the effect of steric factors on their thermodynamic stability and the limits of phosphotropic isomerism. The findings indicated that the thermodynamic stability of I, with respect to their II isomers, increase sharply as the bulkiness of the radicals on the P atom increases. The size of the substituents had a more pronounced effect on the destabilization of

II than on I, and in general showed greater spatial impediments than in the case of their oxygen congeners. This may have been related to the fact that the energy of dissociation of the thiophosphoryl group is much lower than that of the phosphoryl group and, consequently, the P=S group is much more easily destabilized. References 7: 3 Western, 4 Russian.

[253-12172]

UDC 6'118

## PHOSPHORYLATION OF TRIPHENYLPHOSPHAZOHYDRIDE, PART 2

Leningrad ZHURNAL OБSHCHEY KHIMII in Russian Vol 52, No 5, May 82  
(manuscript received 8 Oct 81) pp 1081-1085

ZASORINA, V. A., SHTEPANEK, A. S. and PINCHUK, A. M., Institute of Organic Chemistry, Ukrainian SSR Academy of Sciences

[Abstract] Conditions are described for the phosphorylation of triphenylphosphazohydride by phosphoryl chloride, trichlorophosphazophenylsulfonyl, and by phenyldichlorophosphazophenylsulfonyl. Evaluation of the IR spectra and chemical reactivities of the products in which one, two, or three Cl atoms were replaced by the triphenylphosphazo group showed that these compounds were fairly stable to humidity in the air but decomposed on boiling in water. The mono- and dichloroanhydrides failed to react with alcohols or phenols even under extreme conditions, but reacted with phenolates, ammonia, and aromatic and aliphatic amines. Crown ethers containing the phosphazo radicals were formed by reaction of the dichloroanhydrides with bis[2-(0-oxyphenoxy)ethyl] diphenolates. References 4 (Russian).

[253-12172]

UDC 547.558.1

## DYAD PHOSPHORUS-CARBON TAUTOMERISM: [(DIPHENYLPHOSPHORANYLIDENE)TOSYLMETHYL] TRIPHENYLPHOSPHONIUM CHLORIDE

Leningrad ZHURNAL OБSHCHEY KHIMII in Russian Vol 52, No 5, May 82  
(manuscript received 28 Jul 81) pp 1095-1099

ALADZHEVA, I. M., BYKHOVSKAYA, O. V., PETROVSKIY, P. V. and MASTRYUKOVA, T. A., Institute of Heteroorganic Compounds imeni A. N. Nesmeyanov, USSR Academy of Sciences

[Abstract] Studies were conducted on the dyad phosphorus-carbon tautomerism in a system containing triphenylphosphonium and tosyl groups. [(Diphenylphosphino)tosylmethylene]triphenylphosphoran (I) was synthesized by the reaction of triphenyltosylmethylphosphonium bromide with diphenylbromophosphine in the presence of triethylamine. NMR-<sup>31</sup>P studies showed that protonation of I

resulted in the formation only of the mesomeric I-phosphonium salt regardless of the acid and solvent, i.e., the tautomeric equilibrium was shifted completely to the formation of the PH form. Treatment of I with a large excess of HCl resulted in the formation of a diprotonated product in which the second proton was added to the central carbon atom. References 8: 4 Western, 4 Russian.

[253-12172]

UDC 547.558.1:547.8

PHENOPHOSPHAZINES, PART 6: SYNTHESIS OF DIMETHYLAMINOPROPYL-CONTAINING COMPOUNDS

Leningrad ZHURNAL OБSHCHEY KHIMII in Russian Vol 52, No 5, May 82  
(manuscript received 10 Aug 81) pp 1099-1103

DEMIDOVA, N. I., BOKANOV, A. I., MEDVEDEV, O. S., and STEPANOV, B. I.,  
Moscow Institute of Chemical Engineering imeni D. I. Mendeleyev

[Abstract] In view of the therapeutic usefulness of many phenothiazines, further studies were conducted on the synthesis of seven new dihydrophenophosphazines containing the dimethylaminopropyl group bound to the heterocyclic ring via the N atom or the P atom. The results showed that three such compounds (10-(3-dimethylaminopropyl)-10-thiono-5,10-dihydrophenophosphazine, 5-(3-dimethylaminopropyl)-10-phenyl-10-thiono-4,10-dihydrophenophosphazine, 5-(3-dimethylaminopropyl)-10-phenyl-5,10-dihydrophenophosphazine) induced transient hypotension and bradycardia when administered to experimental animals (unspecified) with myocardial infarctions. References 8: 3 Western, 5 Russian.

[253-12172]

UDC 547.241

INTERACTION OF HYDROXYALKYLAMINO(HYDRAZINO)SYMM. TRIAZINES WITH PHOSPHORIC ACID ISOCYANATES

Leningrad ZHURNAL OБSHCHEY KHIMII in Russian Vol 52, No 5, May 82  
(manuscript received 8 Dec 81) pp 1103-1108

KULIKOVA, O. A., RAZVODOVSKAYA, L. V. and MEL'NIKOV, N. N., All-Union Scientific Research Institute of Chemical Plant Protection

[Abstract] As part of a search for biologically-active compounds, studies are described on the reaction of hydroxyalkylamino- and hydroxyalkylhydrazine-symmm. triazines with isocyanates of phosphoric and thiophosphoric acids. The results showed that reaction of 0,0-diethylphosphoric and 0,0-diethyl-thiophosphoric acids with 2-hydroxyethylamino-, 2-hydroxy-1-propylamino-, and

1-hydroxy-2-butylamino-symm.-triazines resulted in the formation of the corresponding phosphorylated carbamoyloxyalkylamino-symm.-triazines. Carbamoylation of symm.-triazinyl-chloralamides with phosphoryl isocyanates results in the formation of phosphorylate aminals. References 5 (Russian). [253-12172]

UDC 547.241

#### PHOSPHORUS-CONTAINING SYMM.-TRIAZINYLUREAS

Leningrad ZHURNAL OБSHCHEY KHIMII in Russian Vol 52, No 5, May 82  
(manuscript received 21 Jul 81) pp 1108-1112

KULIKOVA, O. A., RAZVODOVSKAYA, L. V., MEL'NIKOV, N. N. and NEGREBETSKIY, V. V., All-Union Scientific Research Institute of Chemical Plant Protection

[Abstract] As part of a search for biologically-active compounds, studies were conducted on the carbamoylation of amino-symm.-triazines by phosphoric acid isocyanates. The investigations showed that reaction of the isocyanates of 0,0-diethylphosphoric and 0,0-diethylthiophosphoric acids with substituted amino-symm.-triazines yielded phosphorylated symm.-triazinylureas. PMR studies revealed that tautomeric equilibrium prevails between many of the phosphorylated symm.-triazinylureas. References 4: 1 Western, 3 Russian.

[253-12172]

UDC 542.91:547.1'118

#### ORGANOPHOSPHORUS DERIVATIVES OF CERTAIN N-SUBSTITUTED LACTAMS

Leningrad ZHURNAL OБSHCHEY KHIMII in Russian Vol 52, No 5, May 82  
(manuscript received 15 Jun 81) pp 1113-1116

GRECHKIN, N. P. and GRISHINA, L. N., Institute of Organic and Physical Chemistry imeni A. Ye. Arbuzov, Kazan' Branch, USSR Academy of Sciences

[Abstract] Since the N-substituted derivatives of lactams possess various physiological activities, studies on the further synthesis of such agents involved synthesis of organophosphorus derivatives by the reaction of the acid chlorides of dialkylphosphides and glycolphosphides with 1-(2-hydroxy-1-aza-1-cyclopentyl)-2,2,2-trichloroethanol or 1-(2-hydroxy-1-aza-cycloheptyl)-2,2,2-trichloroethanol in the presence of  $\text{Et}_3\text{N}$  to yield the corresponding 1-(2-hydroxy-1-aza-cycloalkyl)-2,2,2-trichloroethyl esters. The structures of the products were confirmed by IR and NMR- $^{31}\text{P}$  spectroscopies and chemical analyses. Reaction of the resultant esters with dry hydrogen chloride resulted in an Arbuzov rearrangement, with isolation and identification of the products. References 8: 3 Western, 5 Russian.

[253-12172]

UDC 547.26'.118

## STABLE TRIFLUOROACYLPHOSPHITE

Leningrad ZHURNAL OБSHCHEY KHMII in Russian Vol 52, No 5, May 82  
(manuscript received 21 Nov 81) p 1206

KONOVALOVA, I. V., MIRONOV, V. F., OFITSEROV, Ye. N. and PUDOVIK, A. N.,  
Kazan' State University imeni V. I. Ul'yanov-Lenin

[Abstract] Conditions are described for the preparation of stable trifluoroacylphosphite by the reaction of diisopropylchlorophosphite with trifluoroacetate in pentane for 2 h with heating. The solvent was removed under vacuum, and the product was distilled under 12 mmHg to yield a colorless hygroscopic liquid with a 53-53.5°C bp. References 3: 1 Western, 2 Russian.  
[253-12172]

UDC 541.138.2

## ELECTROCHEMICAL FLUORINATION OF MONOAMIDOPHOSPHITES

Leningrad ZHURNAL OБSHCHEY KHMII in Russian Vol 52, No 5, May 82  
(manuscript received 10 Nov 81) p 1207

NIKITIN, Ye. V., IGNAT'YEV, Yu. A., ROMAKHIN, A. S., PARAKIN, O. V.,  
ROMANOV, G. V., KARGIN, Yu. M. and PUDOVIK, A. N., Kazan' State University  
imeni V. I. Ul'yanov-Lenin; Institute of Organic and Physical Chemistry  
imeni A. Ye. Arbuzov, Kazan' Branch, USSR Academy of Sciences

[Abstract] Techniques previously described were used for the electrochemical fluorination of the monoamidophosphites  $\text{Et}_2\text{NP}(\text{OEt})_2$  and  $\text{Bu}_2\text{NP}(\text{OBu})_2$  during their oxidation on the anode in acetonitrile. Following electrolysis 0,0-dialkylfluorophosphates  $(\text{EtO})_2\text{P}(\text{O})\text{F}$  and  $(\text{BuO})_2\text{P}(\text{O})\text{F}$  were isolated, the structures of which were confirmed by NMR  $^{31}\text{P}$  and  $^{19}\text{F}$  spectroscopies.  
References 2 (Russian).  
[253-12172]

## PESTICIDES

### CHEMICAL ASSOCIATION COMPLAINS ABOUT UNRETURNED BARRELS

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 19 Jun 82 p 2

[Article by A. Yumagulov, deputy to the USSR Supreme Soviet, and R. Bagabov and R. Galimov, instrument controllers of the Ufa "Khimprom" Association: "Where Are the Barrels Rolling?"]

[Text] For many of our brigades, the work day begins with telephone calls: The brigade leaders are running out of containers. First we shake up the executives of the repair shop. They are "our own," and we have power over them. But they can only shrug their shoulders: There is nothing to repair. Then we reach our suppliers. They wearily reject our pleas: "You're barking up the wrong tree, it's 'Sel'khozkhimiya' that's guilty--it returned 75,000 barrels less this month, we're doing everything we can, it's the fault of the clients...."

Meanwhile the shops stand idle because there is nothing to put the finished products in, finished products being awaited anxiously by the grain fields--herbicides.

According to instructions approved by the USSR Gosnab and the State Arbitration Commission, subdivisions of the All-Union "Soyuzsel'khozkhimiya" Association must return 60 percent of the iron barrels for reuse. But the empty barrels roll in the totally opposite direction. Soyuzsel'khozkhimiya failed to return 12,000 barrels from Tambovskaya Oblast, 9,000 from the Tatar SSR and almost 6,000 from Chitinskaya Oblast. And it is hard to count the number of organizations that have failed to return 3,000-4,000 barrels each.

We send herbicides for thousands of kolkhozes and sovkhozes to 655 addresses. But the containers have never been returned in the quantities foreseen by the instructions. Our consumers turn a deaf ear when we ask them to return the containers.

Of course, our association does more than just wait around. Last year we sued "Soyuzsel'khozkhimiya" subdivisions for fines totaling almost a million rubles. We have recently prepared documents to impose more fines on them totaling almost 500,000 rubles. But nevertheless hundreds of thousands of barrels have never been returned.

Sometimes it also happens that we manage to wrest some barrels away, but they are returned with broken spouts or with dents and punctures which cannot be repaired. We are forced to throw up to 150,000 such barrels onto the scrap heap each year.

We suggest immediately making an amendment to the instructions prohibiting our clients from receiving credit for faulty barrels which cannot be repaired and which cannot be used for our products. We also believe it necessary to recall to our unconscientious partners how much significance is attached to timely provision of containers in the necessary quantities in the USSR Food Program. After all, were more packaging available, we could provide thousands of tons more of highly effective herbicides to treat the most diverse crops.

11004  
CSO: 1841/261

MOLDAVIAN CHEMICAL INSTITUTE SYNTHESES ANTITRANSPIRANTS

Kishinev SOVETSKAYA MOLDAVIYA in Russian 10 Jun 82 p 4

[Article by B. Borisov: "Modeling a Molecule"]

[Text] The Laboratory of Plant Growth and Development Regulator Chemistry of the Institute of Chemistry, Moldavian SSR Academy of Sciences has synthesized antitranspirants-- active substances that raise the drought and frost resistance of cultivated plants.

The colleagues of this laboratory are working on a highly practical problem: They are creating new substances capable of actively influencing plants. Whatever for?

"Were you to assume that absolute ecological equilibrium reigns in the plant world, you'd be right to phrase the question in that way," said the laboratory director, Candidate of Chemical Sciences Dmitriy Pavlovich Popa. "But unfortunately as a result of man's intense economic activity this equilibrium is being seriously disturbed. Moreover we cannot give in to the surprises of weather; we cannot rely wholly upon the possibilities nature has to offer."

And so the chemists were given the task of synthesizing substances which could ensure acquisition of regularly high yields no matter how unfavorable the weather and the climatic conditions. It should be noted that this is an especially important problem in Moldavia.

Yields depend on many factors. However, moisture rightfully occupies a special place among them. As we know, there are certain ways to compensate for a lack of moisture. Artificial irrigation as an example. Nevertheless a moisture shortage cannot be solved just by irrigation. And so the scientists suggested the idea of influencing plants by regulating their transpiration. This physiological process of evaporation of water by living plants in a sense contributes to a continuous flow of water within the plant. With its help, water and nutrients are absorbed from the soil and, moreover, plants are protected from overheating.

Tiny stomata that are located on leaves and which regulate transpiration pump enormous quantities of moisture into the atmosphere. A mature birch tree, for example, releases up to 70 liters of water into the atmosphere in just a single day.

K. A. Timiryazev uncovered the nature of drought resistance in his time. Transpiration is unavoidable, he wrote, since a plant must periodically open its stomata in order to let carbon dioxide penetrate into its cells.

But would it be possible, the scientists wondered, to make the stomata close at man's will? For example in periods of especially sultry weather, when evaporation becomes especially intensive and as a consequence the plant inevitably suffers? Apparently so, if substances could be found which influence the hormone system "responsible" for transpiration in the plant.

As we know, all hormones operate according to the "lock and key" principle. There are substances which, using the terminology of physiology, repress a hormone--that is, "lock" it up, making it inactive. And there are others which "release" it.

The task of the researchers was to "build" a key which could be used to "unlock" or "lock" a hormone. Knowing the mechanism of action of a concrete hormone, they created a mathematical model of its molecule. Moreover, a different molecular model was created for each plant.

The search was graced with success. After testing dozens of synthesized compounds the laboratory found several active substances, which they termed antitranspirants.

Experiments conducted by colleagues of the laboratory jointly with colleagues of the "Dnestr," "Selektsiya" and "Kodru" scientific-production associations and with producers of the "Pamyat' Il'ichu" Interkolkhoz Orchard showed that after plants were processed by the synthesized substances, intensity of transpiration decreased by about 50 percent. It is noteworthy that use of these substances was not detrimental to photosynthesis; the yield even increased by 20-30 percent. Crops such as potatoes and beets were found to be especially receptive to the influence of antitranspirants. In comparison with a control group, their sugar content even grew.

"Now the scientists have to thoroughly study the mechanism of action of the synthesized substances upon different cellular organelles," explained laboratory director D. P. Popa. "In particular, we are conducting this research in close interaction with colleagues of the Institute of Plant Physiology and Biochemistry. There are numerous questions, and all of them are extremely interesting. Why for example does photosynthesis not suffer when transpiration is curtailed? Where, in what deep-lying layers of the cell, is moisture stored? By answering these and many other questions, we will be able to influence transpiration with incomparably greater effectiveness, and arm the producers with stricter and more accurate plant growing procedures."

UDC 542.91:547.512

SYNTHESIS OF SOME C-10-ISOPRENOID ALCOHOLS CONTAINING ONE THREE-MEMBERED RING

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHMICHESKAYA in Russian No 5, May 82 (manuscript received 4 Aug 81) pp 1088-1091

MOISEYENKOV, A. M., CHESKIS, B. A., RUBASHEVSKAYA, T. Yu., NESMEYANOVA, O. A. and SEMENOVSKIY, A. V. (deceased), Institute of Organic Chemistry imeni N. D. Zelinskiy, USSR Academy of Sciences, Moscow

[Abstract] Two methods are described for synthesizing a series of cyclopropyl-containing monoterpenoid isoprenoids. The first path proceeds via the reaction of lithium dimethylcyclopropane (I) or lithium dimethylcyclopropene (II) with trans-1,2-bromohydride (III) resulting in about 40% conversion to product. (II) can also react with 1,2-epoxyisopropene forming a mixture of isomers. The second method is the Grignard syn-addition of  $\beta,\beta$  -dimethylmagnesium chloride and formaldehyde to 1-methylcyclopropene, yielding about 60% conversion. The latter reaction apparently proceeds through a 6-membered ring transition state which preserved the stereochemistry. Details of the synthesis and structural confirmations are given. Figures 2; references 15: 3 Russian, 12 Western.

[247-12027]

PETROLEUM PROCESSING TECHNOLOGY

UDC 665.765-404.038

JOINT EFFECTS OF DITHIOPHOSPHORIC ACID ESTER AND ANTIOXIDANTS ON PERFORMANCE PROPERTIES OF MINERAL OIL

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 5, May 82 pp 22-23

BORSHCHEVSKIY, S. B., SHABANOVA, Ye. V., ZAGORODNYY, N. G. and TROFIMOV, G. A., All-Union Scientific Research Institute for Oil Production

[Abstract] High temperatures, catalytic effects of metals and environmental oxidation bring significant changes in lubricating oils. The authors studied joint effects of the methylbenzyl ester of diisobutyldithiophosphoric acid and various phenol and amine antioxidant additives. At 200° C, 2,2-methylene-bis(4-methyl-6-tert-butylphenol) and 2,6-di(tert-butyl)-4-methylphenol had a prooxidational effect, while 4,4-methylene-bis[2,6(tert-butyl)phenol], phenol-alpha-naphthylamine and the mixed products of phenol alkylation by styrene (AO-20) inhibited oxidation. AO-20 reduced the methylbenzyl ester's pro-oxidational action, while the others had little effect. At 180° C in the presence of copper, all tested antioxidants but AO-20 inhibited oxidation and the methylbenzyl ester increased that action. Little change was noted in the M-11 lubricating oil tested because of the additives. The combination of AO-20 and the ester improved antiwear, antiscratch and antioxidation properties better than other combinations. Figures 2; references 4 (Russian). [240-12131]

UDC 662.67

CURRENT STATE AND PROSPECTS FOR USING OIL SHALES IN ENERGY AND TECHNOLOGY

Moscow KHIMIYA TVERDOGO TOPLIVA in Russian No 3, May-Jun 82  
(manuscript received 31 Jul 80) pp 26-34

TYAGUNOV, B. I., STEL'MAKH, G. P., CHIKUL, V. I., GAVRILIN, A. V., ARANOVICH, Yu. V. (deceased) and DOLGOPOLOV, B. M., State Scientific Research Institute for Energy imeni G. M. Krzhizhanovskiy

[Abstract] The authors review reserves and development of oil shale world-wide and in the USSR, where known and estimated reserves approximate a trillion tons. Serious technical difficulties related to sulfur and fly ash pollution

are being attacked by chemical processing to obtain shale tar and other useful products. In the USSR, thermal processing of pulverized oil shale, involving mixing with a solid ash at 800° C in the absence of air, is used to obtain shale tar and gas. A two-stage process is being developed for low-content shales and those with little volatile gas yield. Oil-shale processes are conducted above ground and underground; most common methods are done above ground due to the difficulty in regulating underground processes, their probable polluting of ground water and low heat from the gases obtained. Yet capital investment advantages, avoidance of tailing disposal problems, and other advantages make underground processing a target for development in the future, particularly in the United States. In the USSR, menilite deposits in the Carpathians offer both energy and building material raw materials. Technological problems of acquisition, ecological protection and utilization stand in the way of full realization of these resources. References 11: 8 Russian, 1 Ukrainian, 2 English.  
[246-12131]

PHARMACOLOGY AND TOXICOLOGY

UDC 547.822.412.6

SYNTHESIS AND BIOLOGICAL ACTIVITY OF DERIVATIVES OF 2,6-DIMETHYL-3,5-DICARBETHOXY-1,4-DIHYDROPYRIDINE

Yerevan ARMYANSKIY KHIMICHESKIY ZHURNAL in Russian Vol 35, No 3, Mar 82  
(manuscript received 7 May 80) pp 178-181

YESAYAN, Z. V., CHSHMARTYAN, S. G., APOYAN, N. A. and PAPAYAN, G. L.,  
Institute of Fine Organic Chemistry imeni A. L. Mndzhoyan, ArSSR Academy of  
Sciences, Yerevan

[Abstract] The authors synthesized the title derivatives and determined their composition and structure by infrared and mass spectroscopy. They then studied their antiphlogistic and fever reducing properties in rats. Results indicated that 2,6-dimethyl-3,5-dicarbethoxy-4-(3-pyridyl)-1,4-dihydropyridine and the di-diethylaminoethyl ester of 2,6-dimethyl-4-(3-pyridine)-1,4-dihydropyridine-3,5-dicarbonic acid had some antiphlogistic activity in 50 and 100 mg/kg doses, while related dihydrazides suppressed motor activity and caused catalepsy and hypothermia. Chemical details are given in the experimental section. References 7: 6 Russian, 1 Western.

[243-12131]

POLYMERS AND POLYMERIZATION

UDC 541.124 : 541.15 : 541.64

MECHANISM OF RADIATION ION GRAFT POLYMERIZATION

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHMICHESKAYA in Russian No 4, Apr 82 (manuscript received 2 Nov 81) pp 875-881

KABANOV, V. Ya., ALIYEV, R. E., KUDRYAVTSEV, Val. N., SIDOROVA, L. P. and SPITSYN, V. I., Institute of Physical Chemistry, USSR Academy of Sciences, Moscow

[Abstract] Previously the authors showed that radiation grafting could be done by the ion mechanism as well as the radical mechanism (DOKLADY AN SSSR, 1971). In this study they examine the mechanism of triggering ion graft polymerization, taking into account the frequency heterogeneity of the grafting process. They point out that the ion process in radiolysis has received much less attention than the behavior of radicals, and discuss these factors for polyolefins. Data on the effects of solvents showed a correlation between solvent donor numbers and the rate of grafting, and a complete lack of correlation with other properties of solvents. For radiation ion grafting, polymer swelling in the solvent has less importance than the solvent's donor-acceptor properties. Ion grafting reaches its greatest speed at the glass point of the swelled polymer. Results showed that the solvent's effect on copolymer composition is strikingly different as the amount of solvent is increased. A formula is developed for the dependence of the ion process's contribution on the strength of the solvent dose and the content of inhibiting impurities (such as water) in the system. Figures 4; references 9: 7 Russian, 2 English.

[216-12131]

UDC 541.64 : 546.41

CHEMICAL MODIFICATION OF SURFACE OF CALCIUM CARBONATE WITH 4-AZO-BIS-4-CYANOPENTANIC ACID AND ITS EFFECT ON TRIGGERING AND POLYMERIZATION REACTIONS

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 24, No 4, Apr 82  
(manuscript received 8 Sep 80) pp 729-734

POPOV, V. A., ZVEREVA, Yu. A., KLIMOV, Ye. S., PALAYEVA, T. V. and  
GRISHIN, A. N.

[Abstract] Chemical modifications have previously been shown to improve properties of compositional materials; surface activation and chemical grafting were shown to have a noticeable effect on thermal decomposition. In the present study, the authors studied adsorption of the title acid (ACK) on the surface of calcium carbonate (chalk) and kinetic features of triggering and polymerization of various monomers on the surfaces of filler-carriers of active triggering centers. Reactions were conducted in methanol in the presence of small amounts of water, with chalk in a 20% suspension in a nitrogen stream being mixed into the mass. The thermal decomposition of ACK and its calcium salt were studied in DMF by the nitrogen emission rate; polymerization of methylmethacrylate and acrylonitrile were studied by a dilatometric method, and vinylchloride, by an ampule incubator method. Results showed that chemical adsorption of triggering agents on solid phase surfaces can make major changes in kinetic parameters of all elementary polymerization reactions. Polymerization on filler-carriers was accompanied by microcapsulation of fillers, depending on the nature of trigger agent grafting, monomer type, thermodynamic reaction of the polymer with the reactive medium and diffusion effects. Figures 5; references 18: 13 Russian, 5 Western.

[228-12131]

UDC 541.64 : 547.315

STABILIZATION OF POLYVINYL CHLORIDE WITH CONJUGATED DIENES

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 24, No 4, Apr 82  
(manuscript received 11 Nov 80) pp 793-800

MINSKER, K. S., KOLESOV, S. V., PETROV, V. V. and BERLIN, Al. Al., Bashkir State University imeni 40th Anniversary of October

[Abstract] A possible means of stabilizing PVC (which contains carbonylallyl groups which lower the thermostability of the polymer) involves breaking the conjugation chain in those groups and saturation of the C=C bonds (thus liquidating their accelerating action on the breakdown of adjacent vinyl chloride chains). This bond saturation through gentle chlorination or phosphorylation also increased thermal stability reducing carbonylallyl groups in chlorine macromolecules reduces the initial rate of dehydrochlorination of PVC modified by conjugated dienes. Regeneration of these groups speeds

elimination of HCl right up to the original status of PVC. The thermal stability of carbonylallyl group adducts and conjugated dienes depends on the nature of the diene and in general is markedly higher than that of unstabilized groups. PVC destruction in mixtures with dienes depends on the Diels-Alder reaction balance. In contrast, in the presence of a diene at the destruction temperature a balance is achieved between adducts and  $-\text{C}(\text{O})-(\text{OCH}=\text{CH}-)_n-$  groups that activate polyene growth during polymer decomposition. In the presence of octatriene-1,3,6, sorbic acid, methylsorbate and hexachlorocyclopentadiene, the initial rate of HCl elimination from PVC decreases, as it does with the compounds previously discussed. Conjugated dienes do not inhibit thermal decomposition of PVC previously degraded in a vacuum. Figures 4; references 8 (Russian).

[228-12131]

UDC 541.64 : 537.31

ANOMALIES IN DEPENDENCE OF ELECTRICAL CONDUCTIVITY OF POLYMER ION-RADICAL SALTS OF 7,7,8,8-TETRACYANOQUINODIMETHANE ON STRUCTURE OF ALIPHATIC IONENE POLYCATION

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 24, No 4, Apr 82  
(manuscript received 18 Nov 80) pp 801-806

MOSTOVY, R. M., BERENDYAYEV, V. I., VASHKEVICH, V. A., KOTOV, B. V., ZUBOV, Yu. A., OVCHINNIKOV, S. Yu., TVERSKOV, V. A. and PRAVEDNIKOV, A. N., Scientific Research Physical-Chemical Institute imeni L. Ya. Karpov; Institute of Precision Chemical Technology imeni M. V. Lomonosov, Moscow

[Abstract] In studying the title salts, special interest is devoted to the dependence of electrical properties on polycation structure. Those obtained by the Menshutkin reaction from tertiary aliphatic diamines and aliphatic dihalogenides permit changing polycation structures in wide limits. The authors studied the synthesis, composition and properties of the title salts of 6,6-ionene and other symmetrical aliphatic ionenes (4,4-, 5,5- and 5-0,5-0-ionenes). The data indicate that polymer ion-radical salts obtained by a one-stage method have relatively low resistance (with the exception of 6,6-ionene), and oxygen-containing ionene salts are particularly good conductors. A two-stage process with lithium salt produced a simple ion-radical salt to which the necessary quantity of the title methane was then added, permitting production of complex ion-radical salts of a desired composition. The abnormally-high resistance of 6,6-ionene salts is attributed to chemical and phase irregularities. Separation of the title compound into a crystalline phase was observed where the ratio of TCQM : TCQM<sup>-</sup> equalled 1.5. Figures 4; references 9: 6 Russian, 1 Japanese, 2 English.

[228-12131]

RHEOLOGICAL PROPERTIES OF POLYSTYRENE GAS-FILLED COMPOSITIONS

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHMICHESKAYA TEKHOLOGIYA in Russian Vol 25, No 4, Apr 82 (manuscript received 6 Jun 80)  
pp 477-479

OKUNEV, P. A., PANOV, Yu. T. and MITROFANOV, A. D., Department of Plastic Processing Technology, Vladimir Polytechnical Institute

[Abstract] Little study has been made previously of rheological properties of polymer-gas fusion systems. The authors studied emulsified polystyrene with a melting index of 109 g/10 min at 200° C and 0.51 MPA pressure in the presence of azoisobutyronitrile as a gas source. Tests were done in hermetically sealed chambers to prevent gas loss, where tablets of gas-polymer fusion were formed without heat before being subjected to heat for the tests. Results showed that 5% azoisobutyronitrile reduced viscosity by a factor of ten. Analysis of the data led to the hypothesis that with gas content below 0.4% in a polymer, nearly all the gas introduced into the composition participates in expanding the free volume of the system. With higher gas content and increased temperature, markedly higher viscosity results. The equipment used did not permit tests at pressures above 18 MPA. The viscosity information obtained can be applied in choosing optimum recipes and processing for gas-filled polymers. Figures 4; references 2 (Russian).  
[244-12131]

## RADIATION CHEMISTRY

UDC 541.15

### RADIOCHEMICAL RESEARCH

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHMICHESKAYA in Russian No 4, Apr 82 (manuscript received 1 Dec 81) pp 731-750

SPITSYN, V. I., Institute of Physical Chemistry, USSR Academy of Sciences, Moscow

[Abstract] The author reviews the work of the Laboratory for Radiochemical Studies, which he has directed since its establishment in 1954 by the USSR Academy of Sciences Institute of Physical Chemistry. The laboratory has studied technetium, prometium, many actinides, and uranium fission products, among other projects. Quantum chemistry has been employed in predicting extreme valency of actinides. Practical applications of radioactive elements form another direction of the laboratory's efforts. The review covers general physical and physico-chemical properties of radioactive substances, including actinides and trans-uranium elements such as neptunium, plutonium and americium. Study of actinide properties by electrochemical and other methods focussed on problems such as the internal 6p-atomic orbitals involved in chemical bonds, and the stability of high oxidation levels in these compounds. Discovering a heptavalent state in trans-uranium elements, followed by discovery of Cm(VI), confirmed the need to revise the actinide theory where it states that higher valent forms are merely deviations from actinide behavior norms. Studies of the chemistry of technetium, prometium and protactinium include using the first as an alloy for stainless steel and determining its high anticorrosion durability with 2 years of testing in the Barents Sea. Other topics reviewed include methods for isolating and purifying radioactive fission and trans-plutonium elements, and applications for radioactive indicators in studying structures and properties of certain heteropoly compounds. Figures 9; references 107: 93 Russian, 14 Western.  
[216-12131]

UDC 542.91 : 541.6 : 541.49 : 546.791

SYNTHESIS, STRUCTURE AND THERMOLYSIS OF URANYL ACETATE COMPOUNDS WITH CERTAIN AMIDES

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHMICHESKAYA in Russian No 4, Apr 82 (manuscript received 16 Nov 81) pp 812-818

SPITSYN, V. I., KOLESNIK, V. V., MISTRYUKOV, V. E., YURANOV, I. A., MIKHAYLOV, Yu. N. and DUNAYEVA, K. M., Moscow State University imeni M. V. Lomonosov; Institute of General and Inorganic Chemistry imeni N. S. Kurnakov, USSR Academy of Sciences, Moscow

[Abstract] Addition of a neutral ligand such as ammonia, aliphatic amines and amides into the uranium atom has been found by various studies to reduce thermal stability and affect thermal decomposition of carboxylates. The composition of related oxides during decomposition in a vacuum differ from stoichiometric  $UO_2$  in relation to the content of mobile H atoms at the nitrogen in coordinated ligands. The authors describe changes in the structure of an initial uranyl carboxylate  $UO_2(CH_3COO)_2 \cdot H_2O$  after introduction of nitrogen-containing neutral ligands in the uranyl coordination sphere, and the effect of the coordination and composition of the ligand on the course of thermal decomposition of the complex. The two compounds obtained, bisdiacetatodimethylacetamide uranyl and triacetatodioxy(VI) uranate, have the advantage of being soluble in polar solvents such as water and alcohol. Thermolysis of the complexes was studied in poly-, quasi- and isothermal conditions. Infrared spectra indicate that a fundamental restructuring occurs in the initial uranyl acetate as the coordinated water molecules are replaced by nitrogen-containing ligands; this is accompanied by a change in carboxyl groups from bridge to island forms. The dimer fragments lack concise contacts, and their reaction is purely of the Van der Waals type. Increased temperature contributes to these processes. X-ray structures are  $[UO_2(CH_3COO)_2 \cdot DMAA]_2$  and  $[UO_2(CH_3COO) \cdot Ur_3](UO_2(CH_3COO)_3)$ . Figures 3; references 7: 6 Russian, 1 Western.

[216-12131]

UDC 542.941 : 546.799.4

REDUCING PLUTONIUM TO BIVALENT STATE

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHMICHESKAYA in Russian No 4, Apr 82 (manuscript received 19 Nov 81) pp 818-820

MIKHEYEV, P. B., AUERMAN, L. N., RUMER, I. A., D'YACHKOVA, R. A. and SPITSYN, V. I., Institute of Physical Chemistry, USSR Academy of Sciences, Moscow

[Abstract] Compounds with low oxidation levels are commonly obtained by halogenoid solution reactions with metal. Plutonium with less than 3+ oxidation has not, however, been obtained in this way. Lowering the oxidizing

potential of a system for reducing Am(III) to Am(II) is impossible for large amounts of Pu(III). The authors used a system of dissolved salts containing PSE halogenides to form cocrystals with lanthanoids and actinoids in a trivalent state. Experiments determined that in the 2+ oxidation state these elements did not have an oxychloride phase. Experimental data were processed by sum of least squares method. Results showed that plutonium(III) was reduced by praseodymium(II) to Pu(II), with a standard oxidation potential of -2.59 B. The authors' findings differ from those of Nugent et al. (Journal of Physical Chemistry, 1973). References 5: 1 Russian, 4 Western.  
[216-12131]

UDC 541.124 : 542.943 : 546.799

#### METHODS OF STABILIZING TRANS-URANIUM ELEMENTS AT UNSTABLE OXIDATION LEVELS

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHMICHESKAYA in Russian No 4, Apr 82 (manuscript received 1 Dec 81) pp 821-826

SPITSYN, V. I. and KROT, N. N., Institute of Physical Chemistry, USSR Academy of Sciences, Moscow

[Abstract] The authors review stabilization methods and prospects for their use, including atmospheric oxygen oxidation of ions that have strong reducing properties; oxidation-reduction reactions of ions with solvents, particularly with water; self-oxidation and reduction, or ion disproportions in trans-uranium elements; ion oxidation or reduction by impurities in solvents; and oxidation-reduction reactions triggered by radiolytic and photochemical effects. Some of these processes, such as atmospheric oxygen oxidation and oxidation or reduction by impurities, can be eliminated by corresponding purification techniques, and others are of little importance. With elements having atomic numbers above 97, however, radiolytic effects must be considered. Reactions with ions having strong oxidizing or reducing properties are most difficult to prevent, and directions to accomplish this include selective bonding or unstable ions, temperature reduction, and stabilization in the solid phase. New complexes can be formed only to stabilize tetra-, hexa- and heptavalent actinides.  $\text{OH}^-$  ions have been effective in stabilizing high levels of oxidation, and high concentrations of  $\text{F}^-$  or  $\text{H}_3\text{PO}_4$  have stabilized trans-uranium elements with unstable, +4 oxidation states. Americium(VII) has been obtained by ozonization of cooled Am(VI) solutions in 3-4 M NaOH. References 26: 16 Russian, 10 Western.  
[216-12131]

ACTINOID COPRECIPITATION WITH TRIVALENT IRON ALKYLPHOSPHONATES

Leningrad RADIOKHIMIYA in Russian Vol 24, No 2, Mar-Apr 82 (manuscript received 27 Mar 81) pp 241-243

FEDOSEYEV, D. A., KERMANOV, V. P., KULIKOV, I. A. and FILIN, V. M.

[Abstract] The authors studied extraction of plutonium (IV,VI) in ion and colloidal forms and neptunium (V,IV) by coprecipitation from nitrogen oxide solutions with iso-octylphenyl (I)-iso-octyl-ethoxy-methylene (II)-, iso-octylbutyloxy-methylene (III)-, diiso-octyl-ethoxy-methylene (IV)- and iso-octyl-phenyloxy-methylene (V)-phosphonates of trivalent iron. Actinoid solutions, in ion forms, were prepared by an electrochemical method; valence control was by spectrophotometry. Data showed that the relative content of plutonium (IV) resulting from coprecipitation with all tested alkylphosphonates was 2-3%, indicating 98% ionic plutonium extraction. About 90% colloidal plutonium (IV) and plutonium (V) were extracted, while neptunium (V) remained almost completely in the solution and neptunium (IV) quantitatively entered the iron (III) alkylphosphonate. The ion exchange mechanism of the reaction played an important role in extraction; that role decreased with increasing acidity. With about 0.1 mol/lit. acidity, neptunium (V) extraction was 50-70%; it then passed through a minimum at 1.5 mol/lit. of  $\text{HNO}_3$ , and then increased again to 20-30%. The linear character of plutonium (IV) and neptunium (IV) content in iron iso-octylphenylphosphonate precipitate in relation to actinoids in the initial solution suggests the isomorphic nature of coprecipitation of actinoid ion forms. Figures 2; references 5 (Russian).

[224-12131]

RADIOCHEMICAL PURIFICATION OF MAGNESIUM AND CALCIUM OXIDES ENRICHED WITH STABLE ISOTOPES AND IRRADIATED WITH PROTONS AT 1 GIGAELCTRON VOLT ENERGY

Leningrad RADIOKHIMIYA in Russian Vol 24, No 2, Mar-Apr 82 (manuscript received 25 Feb 81) pp 252-255

ALEKSEYEV, Ye. G., GUSEL'NIKOV, V. S., ZAYTSEV, V. M., KONEVA, T. V. and SEROVA, V. A.

[Abstract] High energy proton irradiation of magnesium and calcium forms long-life radioactive nuclides, beryllium-7 and sodium-22, with half-life respectively of 53.3 days and 2.6 years. This and the high cost of target materials make effective purification essential. The authors first measured  $^{22}\text{Na}$  formations from magnesium-24, -25, and -26 and sodium-40 and -44 at 1 GeV energy, then irradiated pressed magnesium oxide and calcium carbonate tablets of 1mm X 10mm diameter. Gamma-spectrometry using Ge(Li)-detectors yielded

data indicating that  $^{22}\text{Na}$  formation cross-sections from magnesium and calcium were highly dependent on the number of neutrons in nuclei with the same number of protons, with a sharp drop in cross-section when the number of neutrons in the initial nucleus increased. The purification method resulted in a calculated gross yield of magnesium of 97-98%, with a coefficient of purification of  $^7\text{Be}$  and  $^{22}\text{Na}$  of  $5 \cdot 10^2$ . Calcium yield was 98-99%, with purification coefficient of  $^7\text{Be}$  at  $5 \cdot 10^2$  and of  $^{22}\text{Na}$  at  $10^2$ . References 8: 5 Russian,

3 English.

[224-12131]

UDC 541.183 : 546.791

#### SORPTION OF URANIUM FROM SEA WATER BY MIXED INORGANIC SORBENTS

Leningrad RADIOKHIMIYA in Russian Vol 24, No 2, Mar-Apr 82 (manuscript received 10 Jun 81) pp 258-259

AFANAS'YEV, Yu. A., AZHIPA, L. T., RYABININ, A. I., SAVENOK, N. B. and YEREMIN, V. P.

[Abstract] Titanium (IV) oxide hydrate is recognized as one of the most effective sorbents of uranium (VI). The authors studied extraction of microquantities of uranium from Black Sea water by mixed inorganic sorbents based on cerium (IV) oxide hydrate, titanium (IV) phosphates, lead (IV), and silica gel as inert carrier. These substances dissolve with difficulty. After preparing the sorbents, the sea water, containing an average 2.55 mcg/lit. of uranium, was filtered through a column containing the separate sorbents. The data collected indicated that cerium (IV) oxide hydrate was the most effective sorbent, gathering uranium from the sea water at a rate of 1 kg per 4800 liters. The tested sorbents generally were more effective than the previously studied titanogel. Of several elutriators tested, the best was sodium chloride in a 5-6 mol/lit. solution. References 7: 5 Russian,

2 English.

[224-12131]

UDC 66.067 : 546.79 : 546.72

OBTAINING IRON-55 PREPARATIONS OF HIGH RADIOCHEMICAL PURITY

Leningrad RADIOKHIMIYA in Russian Vol 24, No 2, Mar-Apr 82 (manuscript received 27 Jul 81) pp 262-263

YEGOROV, A. I., MOROZOV, B. A., IVANCHENKO, A. F., KARAZHANOVA, G. I. and SAFONOV, A. V.

[Abstract] The authors tested an effective method for purifying iron-54,55 of radioactive manganese-54 by extraction using methylisobutyl ketone (hexone). Extraction was chosen over electrochemical and chromatographic methods for its speed and relative freedom from radiation effects, and the possibility of distant performance of the most dangerous operations. The authors' method used hydrochloric acid solutions in hexone without salting-out agents. Metal foil of irradiated monoisotope iron-54 was placed in a glass with  $MnCl_2$  and HCl, then heated until the iron dissolved. Eventually an  $FeCl_3$  precipitate underwent further stages, and the iron was reextracted by adding double-distilled water to the extractor containing hexone. A coefficient of iron purification of manganese of  $8 \cdot 10^4$  to  $1 \cdot 10^5$  was calculated, with no more than 0.2% iron loss. References 4 (Russian).

[224-12131]

UDC 621.315.592.3

RADIATION DEFECTS IN SURFACE LAYER OF OXIDIZED SILICON IMPLANTED BY IONS OF VARIOUS CHEMICAL IMPURITIES

Moscow POVERKHNOST': FIZIKA, KHIMIYA, MEKHANIKA in Russian No 5, May 82 (manuscript received 10 Jul 81) pp 81-88

LYSENKO, V. S. and NAZAROV, A. N., Institute of Semiconductors, UkrSSR Academy of Sciences, Kiev

[Abstract] Little data is available on formation and energy spectra of defects in thin surface semiconductor coatings in metal-dielectric-semiconductor systems. The authors studied such parameters after implanting an oxidized layer of  $Si-SiO_2$  with  $^{160}O^+$ ,  $^{31}P^+$ ,  $^{40}Ar^+$ , and  $^{75}As^+$  at  $1150^\circ C$  with 100 Kev, and  $^{11}B^+$  at 60 Kev. A volt-farad method was used for studying the nature of radiation defects at room temperature, and a thermal-stimulation charge release method was used in a range of 80-300 K. The  $B^+$ ,  $O^+$ ,  $P^+$  and  $Ar^+$  ions brought fundamental changes in volt-farad characteristics. The thermal-stimulation charge release spectra of silicon dioxide bombarded with  $B^+$ ,  $O^+$ ,  $P^+$  and  $Ar^+$  showed current peaks at 102 K, 115 K, 145 K and 166 K, while  $As^+$  showed a single powerful peak at 181 K, with  $n$ -type silicon; with  $p$ -type, corresponding peaks were at 100 K, 120 K, 140 K, 155 K, 180 K and 210 K, while  $As^+$  again had a single peak, at 195 K. Volt-farad results indicated independent formation of defects, regardless of the impurity, with the degree of alloying being affected by the exact impurity introduced. The defects were at the dielectric-semiconductor boundary and in the latter's surface area. Figures 5; references 41: 12 Russian, 29 Western.

## RADIOLYSIS OF CYCLOHEXANE-ISOOCTANE MIXTURES

Moscow KHIMIYA VYSOKIKH ENERGIY in Russian Vol 16, No 3, May-Jun 82  
(manuscript initially received 22 Oct 79; after revision, 22 Sep 81) pp 221-224

PICHUZHIN, V. I., CHEKH, R., ZIMINA, G. M. and SARAYEVA, V. V., Moscow State University imeni M. V. Lomonosov; Institute of Electrochemistry, USSR Academy of Sciences

[Abstract] The authors used the title radiolysis to study the mechanism of energy transmission relative to mixture composition and radiation temperature for a quantitative evaluation of charge transmission processes and excitation. Perfluorohexane was added to chromatographically pure solutions of the title hydrocarbons. Then they were subjected to a vacuum and irradiated with  $^{60}\text{Co}$  gamma rays at 27 and  $78^\circ\text{C}$ . Individual hydrocarbons were processed by impulse radiolysis and analyzed with a chromatograph using a flame-ionization detector. Results showed that increasing the temperature brought higher yields of isobutane and isobutylene, while adding perfluorohexane reduced yields of both. Products of isoocetyl radical dimerization were not found. Two energy transmission mechanisms were discovered: excitation transmission and charge transmission. The results of other related reactions are also summarized. Figures 2; references 11: 5 Russian, 6 Western.

[241-12131]

## RADIOLYSIS OF ADSORBED WATER MOLECULES ON $\text{Al}_2\text{O}_3$ , $\text{La}_2\text{O}_3$ , $\text{Er}_2\text{O}_3$ and $\text{BeO}$ OXIDES

Moscow KHIMIYA VYSOKIKH ENERGIY in Russian Vol 16, No 3, May-Jun 82  
(manuscript received 24 Dec 80) pp 225-227

GARIBOV, A. A., MELIKZADE, M. M., BAKIROV, M. Ya. and RAMAZANOVA, M. Kh., Radiation Research Sector, AzSSR Academy of Sciences

[Abstract] The authors studied the title oxides by first conditioning them at  $500^\circ\text{C}$  for 12 hours, and then processing them in a vacuum for 5 hours at  $350^\circ\text{C}$ . Double-distilled water was used for the adsorption tests. Ampules containing the oxides were irradiated with gamma-radiation from  $^{60}\text{Co}$ . Analysis of radiolysis products showed  $\text{H}_2$  and  $\text{O}_2$  content in proportions above stoichiometric norms, indicating oxygen entrapment in the oxide structures. Hydrogen yield corresponded to the quantity of water molecules subjected to radiolysis. The oxides had a catalytic effect on the radiation chemical decomposition of the water, and were able to transmit absorbed energy from ionizing radiation to molecules adsorbed on their surfaces.  $\text{BeO}$  had relatively high catalytic activity, apparently due to a recombination mechanism of the decomposition of adsorbed molecules. Figure 1; references 10 (Russian).  
[241-12131]

MAGNETIC EFFECT ON FREE RADICAL FORMATION STAGE IN PHOTOLYSIS AND RADIOLYSIS OF POLYMERS

Moscow KHIMIYA VYSOKIKH ENERGIY in Russian Vol 16, No 3, May-Jun 82  
(manuscript received 12 Feb 81) pp 246-248

ZHDANOV, G. S., Scientific Research Physicochemical Institute imeni L. Ya. Karpov

[Abstract] To study effects of a constant magnetic field on processes in the condensed phase involving free radicals and excited molecules, the authors irradiated polymethylmethacrylate (PMMA), polycaproamide (PA), polyvinyl alcohol (PVA) polypropylene (PP) and polydimethylsiloxane (PDMS) and  $^{60}\text{Co}$ ; gamma-rays at 77 and 273 K in an electromagnetic field, at currents from 280 to 955 kiloamperes/min. Electron spin resonance spectra were taken to determine results. Results showed that irradiation in a magnetic field brought greater increased concentrations of free radicals than did radiolysis in the earth's magnetic field alone. Paired comparison of samples from the magnetic field assisted in reducing measurement errors and in calculating the results of various series of experiments. Magnetic field effects involved particles wherein transitions between various levels of spin multiplicity were possible. PMMA radiolysis takes place as free ions form in the decomposition of excited molecules during charge recombination, and the single or triplet state of the excited molecules determines the likelihood for radical formation. Magnetic effects on other polymers were less pronounced.

References 6 (Russian).

[241-12131]

RUBBER AND ELASTOMERS

UDC 541(64+127+24)

KINETICS OF MOLECULAR CHARACTERISTIC CHANGE OF SKI-3 ISOPRENE RUBBER DURING ROLLER PROCESSING

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 24, No 4, Apr 82  
(manuscript received 20 Dec 80) pp 843-848

VOL'FSO, S. I., KARP, M. G. and KIRPICHNIKOV, P. A., Kazan' Chemical and Technological Institute imeni S. M. Kirov

[Abstract] Contradictory tendencies in SKI-3 rubber call for limiting low-molecular fractions to improve physicomechanical properties on the one hand, while on the other, such fractions promote macromolecular flexibility and enhance durability. Rheological and viscosity tests and gel penetration chromatography were used by the authors to study qualitative and quantitative molecular parameters of various industrial SKI-3 rubbers during mechanical destruction. They sought to determine whether branched structures appeared or only linear macromolecules of lower molecular mass. Results showed more rapid plastification with higher initial molecular mass. An equation,  $M_t = M_\infty + C_1 e^{-k t} + C_2 e^{-h_2 t}$ , was derived which describes the kinetics of mechanical destruction of SKI-3. Theoretical and experimental data agree. Physicomechanical properties of vulcanized rubber improved as molecular mass differences narrowed and molecular mass increased. Figures 5; references 15: 10 Russian, 5 Western.

[228-12131]

## WATER TREATMENT

UDC [628.543.5+628.543.15] : 546.221

### PURIFYING SULFUR-ALKALINE WASTES OF PHENOLS BY SULFONE EXTRACTION

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASL in Russian No 5, May 82 pp 36-39

KOCHETKOVA, R. P., EPPEL', S. A., NIKITISHINA, V. A., BONDARENKO, M. F., VYKHOVANETS, V. V., KOLISNYK, G. P. and KOZIN, V. G., "INUS" [expansion unknown]; "Angarsknefteorgsintez" Production Association; Scientific Research Institute for Petroleum Chemistry; Kazan' Chemical and Technological Institute imeni S. M. Kirov

[Abstract] Phenol removal by carbonization or extraction by organic solvents such as butylacetate either destroy the phenols or cause intensive saponification. The authors sought chemically and thermally-stable extracting agents that would enable recovery of phenols and alkali for reuse in oil purifying processes. Since the phenols were volatile homologs, extractants with high boiling points  $R_2SO_2$  petroleum sulfones, were used. These dissolved well in various organic solvents but poorly in water. The authors studied the thermodynamic balance of water-phenol (such as o-, m-, p-cresols, pyrocatechol and resorcin)-sulfones. No dimerization was noted of the indicated phenols in aqueous or organic phases. Increased temperatures (from 20 to 80° C) reduced the distribution coefficient of the phenols. The pH factor in a range of 2-8 had little effect on phenol extraction. With a ratio of extractant: water of 1 : 10, as high as 96% extraction was achieved, yielding commercial phenols and cutting alkali consumption for recovering light petroleum products while reducing the load on biochemical purification facilities. Figures 5; references 9 (Russian).

[240-12131]

## MISCELLANEOUS

### SCIENTISTS DESIGN BACTERIA TRAP

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 8 Jun 82 p 2

[Article by D. Patyko: "A Sieve for Bacteria"]

[Text] Ladling water with a screen is not as useless as it may seem. Belorussian scientists who have developed an extremely fine polymer "sieve" are doing exactly this to sterilize water. Their microfilter allows water molecules to freely pass but detains "cumbersome" bacteria. This maximally simplifies decontamination of liquids: They need not be boiled, and they need not be processed with radioactive isotopes.

To manufacture their bacteria trap, scientists of the Institute of Physical and Organic Chemistry, Belorussian SSR Academy of Sciences selected chemical compounds which force molecules, of capron for example, to form an unusual cross-linked structure of a strictly determined size. This produces a thin, elastic and very strong film outwardly recalling paper.

11004  
CSO: 1841/261

UDC 541.138.2

REDUCING ORGANIC COMPOUNDS USING ORGANIC METAL ELECTRODE -- ALLOYED  
POLYPYRROLE

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHMICHESKAYA in Russian No 4,  
Apr 82 (manuscript received 17 Sep 81) p 953

AFANAS'YEV, V. A., MAKAROV, A. F. and KHIDEKEL', M. L., Institute of Chemical  
Physics, USSR Academy of Sciences, Chernogolovka Division

[Abstract] Polypyrrole alloyed with  $\text{BF}_4^-$  with properties of an organic metal  
is shown to be useful as an electrode for reducing organic compounds such as  
chlorobenzene, which reduces in DMFA to benzene, and nitrobenzene, which  
selectively reduces to p-aminophenol. The anode can be platinum, graphite  
or a silicarbon, and the substrate does not affect the products of the  
reduction. Reference 1 (English).

[216-12131]

UDC 541.49:547.1'118:546.92

REACTION OF  $\text{Cp}(\text{CO})_2\text{Mn}=\text{C}=\text{CHPh}$  WITH TRIETHYLPHOSPHITE PLATINUM COMPLEX

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHMICHESKAYA in Russian No 4,  
Apr 82 (manuscript received 12 Nov 81) pp 953-954

ANTONOVA, A. B., GUBIN, S. P. and KOVALENKO, S. V., Institute of Chemistry  
and Chemical Technology, Siberian Division, USSR Academy of Sciences,  
Krasnoyarsk

[Abstract] Earlier it was reported that a  $\text{Mn}=\text{C}-\text{C}$  system was capable of  
coordinating electronically unsaturated metal-carbonyl fragments to form  
binuclear compounds. The authors produced two new products through the  
reaction of  $\text{CpMn}(\text{CO})_2(\text{C}=\text{CHPh})$  with  $\text{Pt}[\text{P}(\text{OEt})_3]_4$ : a binuclear heterometallic  
complex with  $\mathcal{M}^{2-}$ -ligands  $\text{C}=\text{CHPh}$  and  $\text{CO}$ , and a manganese complex with  $\eta^2$   
ligand by a diethyl ester of beta-phenylvinylphosphonic acid. The latter  
appears to be an unusual variant of the Arbuzov reaction. References 3:  
1 Russian, 2 Western.

[216-12131]

CSO: 1841

END